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## **Attentional bias to respiratory and anxiety related threat in children with asthma**

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*Doctorate in Clinical Psychology*

*The University of Edinburgh*

*May 2014*

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## **Thesis Abstract**

**Background:** Attention and vigilance is highlighted as an adaptive function which facilitates a faster response to threat. It is also proposed as a maintenance factor in problems with anxiety, and more recently within physical health conditions.

Researchers have hypothesised that due to the role of attention in anxiety, modifying this attention will result in a reduction of anxiety levels. In addition, research is now emerging in relation to the role of attention in paediatric health conditions. Due to the importance of early targeting in interventions for both anxiety and physical health conditions, further research is needed in this area.

**Aims:** The research aims were twofold. The first aim was to review the literature and evidence related to the anxiolytic effect of Attention Bias Modification (ABM) in child and adolescent populations. The second aim was to investigate if children with asthma show an attentional bias to different threat related stimuli (asthma, anxiety or general negative emotion) and the relationship between this and other health related factors.

**Method:** A systematic review of the current literature was carried out to address the first aim. This included 10 quantitative studies which all examined the effect of ABM on either child or adolescent anxiety levels. To address the second aim, 36 children aged nine to twelve participated in an empirical study. 18 of the participants had asthma, and 18 were asthma free and both groups were asked to complete a computer task designed to measure attentional bias to the different threat related stimuli. In addition, caregivers completed a questionnaire to measure their own anxiety levels, and the children with asthma completed measures focused on quality of life, coping strategies and inhaler use.

**Results:** Research regarding the effectiveness of ABM for youth anxiety is in its early stages. However, preliminary conclusions can be drawn suggesting that it may be an effective intervention to reduce anxiety levels. Additional, rigorous research is required to standardise treatment protocols and answer further questions. Within the empirical study, repeated measures ANOVA revealed that children with asthma show an attentional bias to asthma cues whereas children without asthma do not. Furthermore, there was no selective attention to general negative words, suggesting that attentional bias was not due to general sensitivity to emotional stimuli. A

Pearson's correlation showed that vigilance to asthma cues was associated with parental anxiety. There was no attentional bias to anxiety symptom words and no significant correlations between bias scores and the measured health related factors.

**Conclusion:** The results from the systematic review provide further evidence for the role of attention in paediatric anxiety problems. In addition, the outcome of the empirical study suggests an unconscious threat association in childhood asthma. Further research may yield a viable computerised treatment for paediatric anxiety. Regardless of this, it will be important to consider the role of attention in clinical practice, both in the treatment of anxiety and complex chronic health problems such as asthma.

# **Attention bias modification (ABM) as a treatment for child and adolescent anxiety: a systematic review**

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*This review has been written in accordance with Journal of Affective Disorders (Appendix 1)*

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## Abstract

**Background:** Attention Bias Modification (ABM) is a novel computer based treatment for anxiety disorders. It has been proposed as an efficient, accessible psychological therapy and is based on cognitive theories of attention. The present review sought to investigate the efficacy of ABM as a potential treatment for child and adolescent anxiety.

**Method:** A systematic literature review was conducted, using three main databases, PsycINFO, Embase and Medline, to identify original research articles which measured the effect of ABM on anxiety levels in children and/or adolescents.

**Results:** Ten articles met the inclusion criteria and of these ten, three were randomised control trials. A lack of standardisation in relation to the treatment protocol was observed; nonetheless the identified studies generally provided evidence for the efficacy of ABM as an anxiety treatment.

**Limitations:** Due to the nature of the studies found, a statistical meta-analysis was not possible.

**Conclusion:** ABM seems to be a promising, novel treatment for child and/or adolescent anxiety disorders with merits over lengthier, talking based therapies. However, more rigorous research trials are needed to clarify the mechanisms behind ABM and establish effective, standardised treatment protocols.

**Keywords:** Attention bias modification, Anxiety, Children, Adolescents, Review

## 1. Introduction

Anxiety helps alert the brain to danger; it is an emotion which is present in early childhood and continues to develop, providing an adaptive function in order to facilitate the detection and avoidance of threat. However, anxiety becomes a problem when it begins to interfere with everyday functioning and when it becomes persistent or frequent (American Psychiatric Association, 2000). In addition, anxiety disorders are associated with impairments in personal, social and academic functioning (Van Ameringen et al., 2003). Within early life, anxiety related problems are the most frequent of psychiatric disorders, occurring in 2% to 15% of all children and adolescents (Rapee et al., 2009). Problems with anxiety in childhood predicts not only anxiety in adolescence, but also other psychiatric disorders (Bittner et al., 2007), the trajectory of which can continue into adulthood (Pine et al., 2009).

Given this, it is imperative that treatments for childhood anxiety disorders are available and effective. Most psychotherapy treatment trials have followed adult anxiety literature and have researched the effectiveness of Cognitive Behavioural Therapy (CBT) for children; a recent review showed that the remission rate for CBT was 59% compared to 16% for controls (James et al., 2013). However, new research is emerging in the area of anxiety related therapy with the introduction of computer based treatments. These interventions are centered on cognitive theories of anxiety; more specifically relating to attentional biases. There is consistent evidence that people who experience anxiety attend more to threat related stimuli (c.f. Cisler and Kosler, 2010), and this selective attention means that those who are anxious are more vigilant to what they perceive as threatening. Experiencing this vigilance raises anxiety levels, which in turn increases the awareness of threat, resulting in a self-perpetuating system (Asmundson and Stein, 1994). Since a relationship between attention bias and anxiety has been established, researchers have begun to manipulate attention bias to investigate if this has an effect on anxiety levels, resulting in an intervention more commonly known as Attention Bias Modification (ABM).

Much of the research testing the effectiveness of ABM has been carried out with adult populations whereby evidence has shown that ABM can have a positive effect on anxiety levels. Mathews and MacLeod (2002) showed that training attention to avoid negative stimuli had a positive effect on trait anxiety levels of

high-trait anxious students. Similar findings have been reported in Generalised Anxiety Disorder populations (Amir et al., 2009a; Hazen, Vasey, and Schmidt, 2009) and adults with Social Phobia (Amir et al., 2009b). Both a research review and a meta-analysis researching the effect of ABM on anxiety in adults have recently been published. The research review included 15 publications, the majority of which were adult populations and concluded that ABM was associated with reductions in symptoms which were also shown to be maintained up to 4 months after intervention (Bar-Haim, 2010). The meta-analysis of 12 randomised control trials reported that ABM had a statistically significant medium sized effect on anxiety and demonstrated greater benefits for anxiety symptoms relative to control conditions (Hakamata et al., 2010).

ABM is typically carried out using the dot probe task (MacLeod et al., 1986). This was initially developed as a measure of attention bias, and has been repeatedly evidenced as an effective way to do so (c.f. Mogg et al., 1995). This task relies on measuring the reaction times of participants responding to a dot on a computer screen. It has been shown that anxious individuals demonstrate quicker response latencies when the dot replaces threat over neutral words or pictures, thus showing that their attention has been drawn to threat related stimuli. Researchers are able to configure the dot probe task, so that within ABM procedures the participant's attention is typically trained away from threat; that is the dot they react to replaces neutral stimuli instead of threat stimuli, consistently directing their attention away from negative stimuli. In other designs, researchers have also trained attention towards positive stimuli instead of directing away from threat.

To date, as far as the authors are aware, there has not been a systematic review into the use of ABM in child populations. In the existing review of adult studies, Bar-Haim (2010) concluded that assessing this intervention in paediatric populations would be beneficial, especially due to the importance of early interventions in psychiatric populations and the potential difficulties therapists face engaging individuals in this age range in talking therapy (Oetzel and Scherer, 2003). The purpose of this article was to review the available evidence as to the efficacy of ABM as an intervention which could alleviate symptoms of anxiety in children and adolescents.

## 2. Method

### *2.1 Search methodology and inclusion criteria*

In order to identify relevant papers, three databases were searched up until the 10<sup>th</sup> of January 2014: PsycINFO, Embase and Medline. The search strategy included using search terms based around the intervention of interest; ‘attentional training, attentional retraining, attention\* bias modification or bias modification’. In addition, ‘attention\* bias\*’ and ‘selective attention’ were combined with ‘training’, and all terms were combined with ‘anxiety or anxiety disorders’. Truncated versions of the words ‘bias’ and ‘attention’ were used in order to capture all relevant words starting with the stem ‘bias’ or ‘attention’ (i.e. biases and attentional). The reference lists of relevant articles were also scanned for any additional publications. All results were limited to be published from 1990 to present due to the recent nature of the intervention of interest; early suggestions on the efficacy of ABM for anxiety were made by MacLeod in 1995 (c.f. Hakamata et al., 2010).

Articles were included in the review if 1) the study sample was from a child and adolescent population (ages 0-18), 2) a visual bias modification task was used with either picture or word stimuli with the aim to modify attention, 3) the researchers looked at a change in anxiety, 4) anxiety was measured at two time points. Papers were excluded if the intervention included a modification of cognitive bias as well as, or instead of, attentional bias. In addition, review papers, book chapters and editorials not reporting study data were excluded.

### *2.2 Quality Assessment*

The coding form to assess the quality of papers was Downs and Black’s Study Quality Appraisal Checklist (Downs & Black, 1998; see Appendix 2). This checklist was chosen as it was specifically developed for assessing the quality of both randomised and non-randomised studies. The original criteria consist of 27 items, assessing papers over five subscales which measure methodological quality, where a higher score on a subscale indicates a higher quality in terms of that field. The first subscale ‘reporting’ measures how well the information is presented in the paper, allowing the reader to make an assessment of the results. ‘External validity’ contains items which assess how well the results can be generalised to the population from

which the study sample came from. 'Bias' measures biases both in terms of the intervention delivered to the participants, and also the outcome of the intervention. 'Confounding' addresses any biases in the selection of the participants, and 'power' relates to whether any findings are due to chance. A further item was added into the 'confounding' section to account for the absence of an item assessing the measurement of baseline comparability, as suggested in a review of quality criteria for non-randomised research (Deeks et al., 2003). Where questions relied on the paper having a control group, a further response option was added (n/a=0). In addition, to account for the lack of clarity of the question on power, this item was modified to assess whether the authors had achieved the appropriate sample size to reach the desired power, given the effect size. It was changed from having five response options to two, similar to all other questions in the checklist (Yes=1, No=0). Where effect sizes were not provided by the paper, these were calculated and then an estimate of the required sample size, given the effect size and statistical analyses was calculated using a computer programme (Faul et al., 2007). All papers were scored by the first author. In addition, the second author scored 40% of the papers, chosen using a random number generator. The inter-rater reliability for the two raters was found to be  $k=0.89$ ,  $p<0.001$  indicating 'almost perfect' reliability (Landis et al., 1977). The two reviewers discussed any discrepancies in ratings and came to a consensus.

### 3. Results

#### 3.1 Searches

Over the three databases, the search terms produced 407 potential papers. Fig. 1 shows a flow chart of the study selection procedure. All duplicates were removed, leaving 223 articles. The title and abstract of each of these were then screened, and 72 were removed as the sample was from an adult population, 56 papers were removed as the intervention researched was not ABM, and 23 were removed as the methodology was not original research. 72 papers were then screened using the full document; of these 62 papers were removed. This left 10 papers to be included in the systematic review. No additional papers were found through hand searching reference lists. Table 1 displays the characteristics for each included study. Of the

included 10 papers, three were randomised control trials, four were controlled before-after studies, one was an uncontrolled before-after study, and two were multiple baseline analyses. Where researchers did not specify the research design, a research algorithm was used to determine design (Viswanathan et al., 2013). Three studies used ABM as an adjunct to CBT, whereas seven studies used ABM as a standalone treatment.

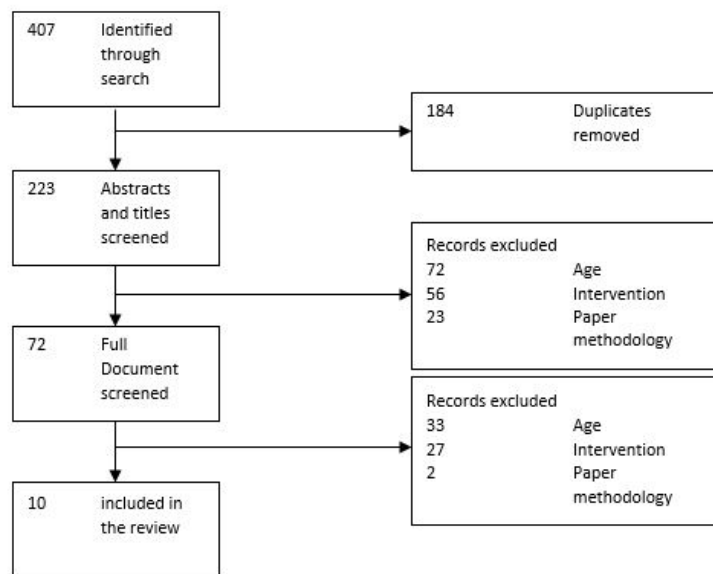


Fig. 1. Search strategy and results

### 3.2 ABM Method

As mentioned in the introduction, most ABM research uses the dot probe task which is also reflected in this review ( $n=8$ ), though two papers used different ABM methodology. Bar-Haim et al. (2011) used the emotional-spatial cueing task. In some ways this is similar to the dot probe task given that it requires a reaction to a target which appears in place of either neutral or threat stimuli. The procedure differs in that the two different stimuli are not presented simultaneously on screen and therefore they do not compete for attention. They are instead presented as separate trials, and the target either appears in the location of the stimuli or at an alternative location. It has been shown that response latencies are longer when the

target appears in the alternative location compared to where the threat stimuli is, showing a difficulty in disengaging attention from threat. In the visual search paradigm used by Waters et al. (2013), participants in the experimental group are trained to attend towards positive stimuli by searching and clicking on happy faces amongst a field of happy and angry faces as quickly as possible, compared to the control group where participants search for pictures of birds amongst flowers. The visual search paradigm has previously been used and validated as an effective way to modify attention (Dandeneau et al., 2007).

### *3.3 Direction of trained attention*

The majority of papers trained attention away from threat ( $n=7$ ). This has been the typical method since ABM interventions were first established. However, some evidence suggests that an attentional bias for threat related information only exists in a proportion of anxious individuals, and that furthermore, an avoidance of threat can be related to poor therapy outcomes in anxiety (Eldar et al., 2012). To compensate for any adverse effects of training attention away from threat, some researchers have investigated the effects of training attention towards positive stimuli, and three papers in this study used this procedure (Britton et al., 2013; Pitică et al., 2010; Waters et al., 2013).

### *3.4 Outcome measures*

There was a variety of anxiety related outcome measures used in the included studies. Where some studies used a combination of clinician rated anxiety and self-report measures ( $n=6$ ), other studies relied solely on either parental or self-report anxiety measures ( $n=4$ ). Measures used in the reviewed studies are detailed in Table 1. In addition, two papers included a stress task and used analogue mood scales to measure negative mood state both pre and post stress induction (Bar-Haim et al., 2011; Eldar et al., 2008). This required the participant to indicate a point on a horizontal line which was divided into 30 sections, ranging from either relaxed to anxious, or sad to happy, where higher scores indicated a more anxious or depressed state.

Most papers ( $n=8$ ) used an attentional bias task to measure selective attention pre and post-intervention. In doing so, they were able to more easily attribute change to a modification in attention. Of these, seven studies used the dot probe as their attentional bias task, and one study used the emotional-spatial cueing task (Bar-Haim et al., 2011).

### *3.5 ABM as a standalone treatment*

#### *3.5.1 Training attention away from threat*

Five studies used ABM as a standalone treatment and trained attention away from threat. Two such studies were interested in the effects of ABM on stress vulnerability (Bar-Haim et al., 2011; Eldar et al., 2008). In both pieces of research, the same stress induction task was utilised which required participants to complete a difficult puzzle task whilst being filmed and timed. Both of these studies found that after the intervention and subsequent stress induction task, those in the ABM condition where attention was trained away from threat showed no change in anxiety levels compared to the ABM toward threat (Eldar et al., 2008) and control group (Bar-Haim et al., 2011) who both showed elevated anxiety levels. The researchers concluded that attentional responses to threat influence the individual's ability to regulate anxiety in the face of stress. Differences were however noted between the papers; where neither ABM group reported significant changes measured by the State-Trait Anxiety Inventory for Children (STAIC) in the study by Eldar et al. (2008), both intervention and control group demonstrated significant STAIC anxiety reductions in the study by Bar-Haim et al. (2011). This difference may have been influenced by the research populations; the participants in the study by Eldar et al. (2008) were non-anxious individuals whereas those in the Bar-Haim et al. (2011) study were from an anxious population. In addition, those trained away from threat in the ABM condition showed decreased attentional bias post-intervention in one study (Bar-Haim et al., 2011), where no change in attentional bias was reported in this condition in the other study (Eldar et al., 2008). Eldar et al. (2008) did however include a condition training attention towards threat and found an increased vigilance to threat post-intervention.



The three remaining studies in this category all reported a positive effect of ABM on anxiety levels post-intervention. One of these studies was a randomised control trial using a double blind procedure, where the researchers compared an ABM group designed to train attention away from threat and two control ABM conditions (Eldar et al., 2012). Clinician-rated anxiety symptom counts and severity reduced significantly in the ABM condition but not in the two control conditions. Parent and child self-report levels of anxiety recorded on the Screen for Child Anxiety Related Emotional Disorders (SCARED) also reduced, but across all groups. There was also a reduction in bias towards threat at post-treatment in the ABM condition but not the control conditions. A moderated mediator analysis was conducted to assess a relationship between training condition and anxiety change determined by attentional bias change and an interaction between attention bias and training condition. The analysis revealed non-significant results which the authors attributed to the small sample size. Neither of the two remaining studies used a control group, however they both found that ABM had an anxiolytic effect. Rozenman et al. (2011) recruited participants with a clinical anxiety diagnosis, assessed using semi-structured interviews. At post-treatment there were significant reductions across all anxiety self-report measures (see Table 1). An overall mean change in attentional bias from pre to post-intervention was found but this change did not reach significance level. In addition, Cowart and Ollendick (2011) recruited three participants to a multiple baseline design analysis, however only two completed treatment. After ten, twice weekly sessions of ABM, both participants were reported to have sub-clinical compared to clinical levels of social anxiety pre-treatment using semi-structured interviews. On the parent version of the Spence-Children's Anxiety Scale (SCAS), both participants showed a decrease in anxiety levels. Post-treatment data in relation to attentional bias was not considered by the researchers as neither participant showed an attentional bias toward threat at pre-treatment.

Table 1. Characteristics of included studies

Study		Participants			Intervention	Outcomes	
Author	Design; setting; country	Inclusion	Sample Size	Gender; mean age	Intervention type; differences between groups	Anxiety Measures	Anxiety findings; effect size of main analysis (Cohen's <i>d</i> )
Bar-Haim et al., 2011	Randomised control trial; NR; Israel	Children with a stable profile of high anxiety	N <sub>intrv</sub> 18 N <sub>cntrl</sub> 17	29% male; 10 years	Emotional-spatial cueing task with face stimuli and stress induction task; ABM condition trained attention away from threat, ABM control is not designed to direct attention	SCARED-C STAIC Analogue mood scales CDI	In response to stress, children in ABM group reported less state anxiety relative to controls. - <i>d</i> =0.78
Britton et al., 2013, experiment 1	Controlled before-after; NR; NR	Youths seeking treatment diagnosed with anxiety disorder <sup>i</sup>	N <sub>intrv</sub> 18 N <sub>cntrl1</sub> 18 N <sub>cntrl2</sub> 17 N <sub>cntrl3</sub> 16	43% male; 11.8 years	Dot Probe task with face stimuli; Anxious youths experienced CBT plus attention towards positive (ABMT), CBT plus no attention direction and CBT only. Non-anxious youths experienced no CBT or attention training.	K-SADS-PL CGI PARS SCARED-C/P CDI	No effect of ABM was found, however those who received computer training showed reductions on self-reported measures of anxiety earlier than CBT alone. <i>d</i> =0.79
Cowart and Ollendick 2011	Multiple baseline study; NR; NR	Children recruited from community and mental health clinic meeting diagnostic criteria for social anxiety disorder	N <sub>tot</sub> 3	100% male, 8.5 years <sup>ii</sup>	Dot Probe task with face stimuli; both participants were trained to attend away from threat	ADIS-P SCAS-P	Both children experienced reductions in clinician and self-reported social anxiety levels. n/a
Eldar et al., 2008	Controlled before-after; Community; Israel	Children recruited from the community with anxiety in normal ranges	N <sub>tot</sub> 26	69% male, 9.5 years	Dot probe task with face stimuli and stress induction task; one group was trained to attend towards threat and one group was trained to attend away from threat	STAIC Analogue mood scales	Only children trained to attend towards threat reported elevated anxiety levels following stress induction. <i>d</i> =0.83
Eldar et al., 2012	Randomised control trial; Child Anxiety Clinic; Israel	Children seeking treatment diagnosed with anxiety disorder(s) <sup>iii</sup>	N <sub>intrv</sub> 15 N <sub>cntrl1</sub> 15 N <sub>cntrl2</sub> 10	55% male, 9.8 years	Dot Probe task with face stimuli; ABM condition trained attention away from threat, placebo 1 was same as ABM but probe appeared equally between threat and neutral, placebo 2 comprised all neutral-neutral stimuli	ADIS-C/P SCARED-C/P CDI	Anxiety severity and symptoms reduced in the ABM condition but not the placebo conditions. <i>d</i> =0.89, <i>d</i> =0.99

Study		Participants			Intervention	Outcomes	
Author	Design; setting; country	Inclusion	Sample Size	Gender; mean age	Intervention type; differences between groups	Anxiety Measures	Anxiety findings; effect size of main analysis (Cohen's <i>d</i> )
Pitică et al., 2010	Multiple baseline study; Community; Romania	Children from a wider research sample, with high anxiety compared to the mean of the original sample	N <sub>tot</sub> 4	75% male, 11.4 years	Dot probe task with face stimuli; all participants trained to attend to positive stimuli.	SCAS-C	Training reduced vigilance to threatening stimuli but no general changes in anxiety levels were observed. <i>n/a</i> .
Riemann et al., 2013	Controlled before – after study; Residential treatment facility; USA	Youths admitted to residential treatment facility diagnosed with anxiety disorder(s)	N <sub>intrv</sub> 21 N <sub>cntrl</sub> 21	48% male; 15.6 years	Dot Probe task with face stimuli; All received CBT, 88% also received medication. AMP condition trained away from threat, ACC condition attention not directed.	SCARED-C BDI-II CY-BOCS-SR	Youths in the AMP condition had significantly greater reductions in anxiety symptoms from intake to discharge than youths in ACC condition. <i>d</i> =0.69
Rozenman et al., 2011	Before-after study; Laboratory and community; USA	Youths accessing services at treatment centre, diagnosed with SAD, GAD or SP	N <sub>tot</sub> 16	31% male, 14 years	Dot Probe task with face stimuli; All youths were in ABM group and attention was trained away from threat.	K-SADS-P PARS SCARED-C/P CDRS-R MFQ-C/P PAQ	Overall significant decrease in clinical symptoms across all measures. Range <i>d</i> =1.18-2.12
Shechner et al., 2014	Randomised control trial; Anxiety Clinic, Israel	Youths seeking treatment, meeting diagnostic criteria for SAD, SP, SPP or GAD	N <sub>intrv</sub> 18 N <sub>cntrl1</sub> 25 N <sub>cntrl2</sub> 20	56% male, 11.1 years <sup>ii</sup>	Dot Probe task with face stimuli; Those in ABM group received CBT plus training away from threat, those in placebo received CBT plus ABM with no attention direction. A third group received CBT plus no ABM.	ADIS- C/P SCARED-C/P	Both ABM and placebo attention showed greater reductions in clinician rated anxiety frequency and severity than CBT alone. Only ABMT showed significant reductions in self-report anxiety. <i>d</i> =0.87, <i>d</i> =0.86
Waters et al., 2013	Controlled before-after study; Community; Australia	Youths referred to the research, diagnosed with a principal anxiety disorder	N <sub>intrv</sub> 18 N <sub>cntrl</sub> 16	35% male, 9.6 years	Visual-search training paradigm with pictorial stimuli; Those in ATP condition were trained to search for positive stimuli, those in the ATC condition were trained to search for neutral stimuli.	ADIS-C/P SCAS-C/P CES-DC	Children in the ATP condition showed greater reductions in clinician rated anxiety severity and no. of diagnoses compared to the ATC condition. <i>d</i> =0.81

*Note:* SCARED-C/P, Screen for Child Anxiety Related Emotional Disorders- Child/Parent version; STAI, Spielberg Trait Anxiety Scale for Children; CDI, Children's Depression Inventory; K-SADS-PL, The Kiddie Schedule for Affective Disorders and Schizophrenia-Present and Lifetime Version; CGI, Clinician's Global Impression Scale; PARS, Pediatric Anxiety Rating Scale; ADIS-C/P, Anxiety Disorders Interview Schedule for DSM-IV, Child/Parent version; SCAS-C/P, Spence Children's Anxiety Scale-Child/Parent version; BDI-II, Beck Depression Inventory-II; CY-BOCS-SR, Children's Yale-Brown Obsessive Compulsive Scale-Self Report Version Severity Rating Scale; K-SADS-P, The Kiddie Schedule for Affective Disorders and Schizophrenia-Present Version; CDRS-R, Children's Depression Rating Scale – Revised; MFQ-C/P, Mood and Feelings Questionnaire-Child/Parent version; PAQ, Participant Acceptability Questionnaire; CES-DC, The Centre for Epidemiologic Studies Depression Scale for Children; SAD, Separation Anxiety Disorder; GAD, Generalised Anxiety Disorder; SP, Social Phobia; SPP, Specific Phobia; NR, not reported

<sup>i</sup> Excluding obsessive compulsive disorder (OCD) and posttraumatic stress disorder (PTSD)

<sup>ii</sup> Based on data of completers

<sup>iii</sup> Excluding PTSD, OCD or major depressive disorder

Table 2. Methodological quality of the included studies

Author, year	Reporting (0-11)	External Validity (0-3)	Bias (0-7)	Confounding (0-7)	Power (0-1)
Bar-Haim <i>et al.</i> (2011)	7	0	5	3	1
Britton <i>et al.</i> (2013)	6	0	7	6	1
Cowart and Ollendick (2011)	6	0	4	1	0
Eldar <i>et al.</i> (2008)	7	1	6	3	1
Eldar <i>et al.</i> (2012)	10	1	6	6	1
Pitică <i>et al.</i> (2010)	7	0	5	1	0
Riemann <i>et al.</i> (2013)	8	1	6	6	1
Rozenman <i>et al.</i> (2011)	9	1	4	1	1
Shechner <i>et al.</i> (2014)	8	1	5	6	1
Waters <i>et al.</i> (2013)	8	1	7	6	1

### *3.5.2 Training toward positive stimuli*

The two studies in this category reported different outcomes in terms of anxiety, however both demonstrated a vigilance toward positive stimuli post-intervention. It is worth noting that the two studies implemented different research design and ABM procedures. Waters et al. (2013) used the visual search ABM procedure (Dandeneau et al., 2007) and randomised 37 participants to either an ABM control or ABM towards positive condition. Those in the ABM towards positive condition showed significant reductions in blinded clinician rated anxiety severity which was not demonstrated in the control group. Both groups showed reductions in the number of diagnoses, however the ABM towards positive group had significantly fewer diagnoses compared to the control group at post-intervention. These results remained the same after an intent-to-treat analysis. Anxiety levels reduced significantly across both groups as measured by the SCAS. A moderated mediator analysis did not find an interaction between attention training condition and change in attention bias in predicting change in diagnosis, however small sample sizes were cited for limited statistical power. Pitică et al. (2010) recruited four participants for a multiple baseline single case exploration design and utilised the dot probe as their measure and ABM intervention. They found a reduction in vigilance for threat and an increase attentional bias for positive stimuli in three out of the four participants, however no generalisable changes on the SCAS at post-intervention. Statistical analysis was restricted due to the design and limited sample size.

## *3.6 ABM as an adjunct treatment to CBT*

### *3.6.1 Training attention away from threat*

Two studies which trained attention away from threat used the ABM procedure as an adjunct to CBT (Riemann et al., 2013; Shechner et al., 2014). This is of interest given that the interventions target different levels of attention and cognition. Shechner et al. (2014) delivered the same, manualised CBT sessions to all participants (Kendall et al., 2006) whereas CBT in the Riemann et al. (2013) study was not manualised. Both studies reported anxiety reductions as measured by the SCARED, however where this was confined to the active ABM group in the study by

Shechner et al. (2014), significant reductions were shown in both the ABM intervention and control group in the study by Riemann et al. (2013). To further investigate this, a reliable change index was carried out as a measure of the clinical significance of symptom change, which indicated that 52.4% of those in the ABM group showed reliable change, compared to 4.8% in the control ABM group. This study did not include a clinician rated measure, however Shechner et al. (2014) reported significantly greater clinician measured anxiety reductions in both the ABM intervention and control condition compared to CBT alone. In addition, Riemann et al. (2013) did not include a CBT alone control group, and did not measure attentional bias pre and post-intervention, whereas Shechner et al. (2014) demonstrated a shift in attention away from threat in all treatment groups. Where both studies included anxious participants, the study by Riemann et al. (2013) was conducted in an inpatient unit specialising in complex anxiety.

### *3.6.2 Training attention toward positive stimuli*

Similar to Riemann et al. (2013) and Shechner et al. (2014), Britton et al. (2013) were interested in the augmenting effects of ABM on CBT. Therefore, all anxious participants received manualised CBT (Kendall et al., 2006) and were also randomised to receive ABM training toward positive stimuli, ABM with no attention direction or CBT alone. There was also non-anxious comparison group where the participants received no ABM or CBT in order to determine the stability of attentional bias. All treatment groups showed a significant decrease in anxiety symptoms as measured by clinicians. The parent and child SCARED measure showed that the groups receiving ABM (toward positive and no attention direction) reported reduced symptoms from baseline to mid-treatment whereas the CBT only group showed delayed reductions becoming visible from mid to post-treatment. Although attention bias for both ABM groups was similar at baseline (no attention bias), an attention bias away from positive stimuli was detected post treatment. The healthy, treatment-free group showed a stable attentional bias for positive stimuli across time, however an unstable threat related attentional bias.

### *3.7 Methodological Quality*

Table 2 outlines the quality assessment ratings of each paper as measured by the adapted Downs and Black criteria (Downs and Black, 1998). The original quality criteria do not specify a critical point for low to high quality papers, however previous research has set a cut-off point of 14 for this purpose (Livingston et al., 2012). Based on the quality criteria, the study by Eldar et al. (2012) was of the highest methodological quality within this review, and although all of the papers ranged from low average to high average, only two papers scored below 14 (Cowart and Ollendick, 2011; Pitică et al., 2010).

The papers which scored the highest in terms of quality included a control group, and similarly, three of the papers which were deemed the lowest quality did not have a control group (Cowart and Ollendick, 2011; Pitică et al., 2010; Riemann et al., 2013). Although these papers used valid and reliable measures, with one using semi-structured interviews to determine levels of anxiety and subsequent change (Cowart and Ollendick, 2011), as no control group was utilised, the researchers were unable to control for confounding variables by using randomisation, baseline comparisons or blinding. The studies by Pitică et al. (2010) and Cowart and Ollendick (2011) both used multiple baseline design analyses. Although the researchers presented these papers as initial exploratory pieces of research, definitive conclusions cannot be reached due to their methodological weaknesses. In addition, these papers produced a mixed picture of ABM effectiveness and the researchers were not able to conduct robust statistical analyses due to the limited sample sizes.

Of the highest rated three papers, only one of these was defined as a randomised control trial (Eldar et al., 2012), however the other two also used a control group, randomisation and blinding of research staff and participants (Riemann et al., 2013; Waters et al., 2013). The remaining two randomised control trials differed in terms of quality. Where the study by Shechner et al. (2014) was also considered high in terms of quality, the research carried out by Bar-Haim et al. (2011) scored relatively low comparatively. Although this study used randomisation, there was a lack of information on baseline similarities or differences and the concealment of randomisation was not evident.

In terms of quality related trends, a consistent problem was a lack of information regarding the recruitment of the participants, both in terms of the source and the representative nature of the participants. This is reflected in the fact the highest score on the 'external validity' category was one out of three, which was reached by six papers (Eldar et al., 2008; Eldar et al., 2012; Riemann et al., 2013; Rozenman et al., 2011; Shechner et al., 2014; Waters et al., 2013). These six papers included information about the settings in which the intervention was administered, the validity of which are considered in the discussion section of this review. No papers provided sufficient information to determine the representative nature of the participants included.

Generally, the 'reporting' nature of the studies was good, however adverse effects were not routinely commented upon. This may have been due to the non-pharmacological nature of the research and subsequently the less obvious adverse effects, however one paper was able to comment on relevant issues (Eldar et al., 2008). In addition, presentation of the results was generally good, although there were some inconsistencies of actual probability values being reported. Three such papers were inconsistent in reporting actual probability values (Eldar et al., 2008; Eldar et al., 2012; Waters et al., 2013), and four papers either did not report actual values or had no probability values to report (Bar-Haim et al., 2011; Britton et al., 2013; Cowart and Ollendick, 2011; Pitică et al., 2010). All of the ten papers used valid and reliable measures of anxiety, and in addition, all used previously validated ways of measuring attentional bias.

#### 4. Discussion

This systematic review intended to appraise the evidence for the use of ABM as an intervention for childhood anxiety problems. Generally, the research highlights the potential efficacy of this intervention. Despite the positive findings, it is important to consider that only ten relevant studies were reviewed, highlighting the fact that this research area is in its primary stages. In addition, only three of the selected studies were randomised control trials and although all were powered to carry out the statistical analyses they used, they all cited small sample sizes as a limitation. Using larger sample sizes would have allowed for mediational analyses to investigate the



relationship between attention bias and anxiety change, perhaps providing further information on the mechanism behind this relationship. Although all three randomised control trials found that ABM had a positive effect on anxiety, this was demonstrated in different ways across the studies. Results were considered in terms of whether ABM was a standalone or adjunct treatment, and also in terms of the direction of attention and type of stimuli. Initial data suggest that there is a general anxiolytic effect of ABM regardless of these individual factors, however there are individual differences in terms of the outcomes. This complexity of results is reflected across the other studies in this review, suggesting that attentional bias change is a multifaceted cognitive mechanism which is not yet fully understood. Complicating the picture is the lack of standardisation across the studies, both in design quality but also methodology.

#### *4.1 Quality and standardisation*

Three of the included studies were interested in the supplementary effects of combining both CBT and ABM together (Britton et al., 2013; Riemann et al., 2013; Shechner et al., 2014). This combination may be of interest to researchers and clinicians due to the fact that both therapies may work on different levels of cognition; it has been proposed that CBT involves ‘top down’ processes which are more concerned with conscious efforts at processing information (Clark and Beck, 2010), whereas using ABM involves unconscious processing of information congruent with a ‘bottom up’ approach. Although these three studies reported positive results of ABM, they also presented some variations within the results. Two studies found that by clinician ratings, the placebo groups also responded to ABM treatment over CBT alone (Britton et al., 2013; Shechner et al., 2014), however Shechner et al. (2014) commented that the CBT effects found in their study were weak relative to other CBT studies and tentatively attributed this to the delivery of the CBT. When assessing by self-report, all studies demonstrated reductions in active ABM over placebo ABM. Reasons for the mixed results could be due to differences in the methodology. Britton et al. (2013) and Shechner et al. (2014) used the same manualised CBT treatment whereas Riemann et al. (2013) relied on the existing CBT treatment for that population which was not manualised. Similarly, the

two studies using manualised CBT also included a CBT alone treatment group, whereas Riemann et al. (2013) did not. This makes it difficult to comment on any placebo effects of completing a computer task, whether attention is directed or not. Furthermore, in two studies a proportion of the participants were also receiving pharmacological treatment (Riemann et al., 2013; Shechner et al., 2014) whereas the participants were medication free in the research by Britton et al. (2013).

Another clear variation between these studies, and in fact across all of the included studies in this review, is where the ABM treatment took place. The intervention settings varied; occurring at either the participant's home, in the laboratory, in an inpatient setting or at school. As ABM is a novel intervention which is not yet routinely utilised, it was difficult to assess if the studies were executing the intervention in a valid setting, representative of where it would usually take place. This was further compounded by the fact that one of the proposed benefits of ABM is that it would be able to be accessed at the patient's convenience, possibly at home, and could increase engagement with hard to reach populations (Bar-Haim, 2010). Therefore, when reviewing this with the quality criteria it was decided that those researchers who carried out the intervention in settings where it could potentially be used in the future were ecologically valid. However, this does not control for the fact that the settings varied between papers and on inspection of the included papers there were no clear indications of the most efficacious environment for the intervention.

A further clear difference between the papers was in relation to the nature of the ABM intervention delivery. The number of sessions, trials and frequency of ABM sessions ranged between the studies; for example Eldar et al. (2012) delivered 4 training sessions over 4 weeks, whereas Rozenman et al. (2011) delivered 12 training sessions over 4 weeks. On reviewing the outcomes of each study, there were no clear trends depending on the frequency and the number of ABM sessions, which is also reflected within the adult literature (Bar-Haim, 2010). In terms of this review, this may be due to the fact that there were other inconsistencies across the research. For example, where most studies utilised the dot probe task to modify attention, two studies used different procedures (Bar-Haim et al., 2011; Waters et al., 2013). Both of these studies also measured attentional bias pre and post-intervention and

demonstrated a shift in the direction the researchers were expecting, suggesting that these ABM procedures were valid. There have been reported concerns around which aspect of attention the dot probe modifies due to the paradigm not distinguishing between a faster engagement with threat or a difficulty in disengaging from threat (Bar-Haim et al., 2007). Consequently, Bar-Haim et al. (2011) used the emotional spatial cueing task in both the pre and post attentional measure and intervention which is specifically targeted at the disengaging aspect of attention. Combining the dot probe and another attentional modification paradigm (Waters et al., 2013) could lead to uncertainty regarding which attentional component has been measured and/or modified.

Within two studies, attentional bias was not tested pre and post-intervention, reducing the ability to attribute change to a shift in attention (Cowart and Ollendick, 2011; Riemann et al., 2013). Similarly, a change in attentional bias was either not detected (Rozenman et al., 2011) or it was modified in the opposite way to what was expected (Britton et al., 2013). This further highlights the complex and unclear nature of the mechanism of attentional bias. Overall, an effect has been indicated, however when looking at individual studies the nature of this effect is unclear. A potential explanation is that rather than a shift in attention either away from threat or toward positive stimuli, the effect on anxiety can be attributed to any change in attention; that is if someone is able to shift their attention in any direction, the enhanced ability to control this cognitive mechanism may have anxiolytic effects (c.f. Cisler and Koster, 2010). This attentional control hypothesis may explain the finding from Britton et al. (2013) where the ABM intervention was designed to promote vigilance towards positive stimuli, yet after the intervention, attention was shifted away from positive stimuli and still reduced anxiety. Presumably in line with this hypothesis, individuals exhibiting any shift in attention would demonstrate enhanced attentional control and therefore should show a reduction in anxiety. This was not the case in the study by Eldar et al. (2008) which encompassed two attention training conditions; towards and away from threat. They found that there was no change in self-reported anxiety across both groups, however after a stress induction task only the ABM toward threat group showed an increase in anxiety. Conversely, a similar piece of research was carried out in an anxious, adult population which

showed the opposite; both groups trained towards and away from threat showed a reduction in anxiety during a stress task compared to those in a placebo ABM training condition (Klumpp and Amir, 2009). Previous researchers have suggested using non-affective stimuli such as geometric shapes could be useful in testing the attentional control hypothesis and have agreed that research systematically designed to do so needs to be carried out before any conclusions can be drawn here (Bar-Haim, 2010; Eldar et al., 2012).

Where all but one (Eldar et al., 2008) pieces of research were with children and adolescents who were either diagnosed with one or more anxiety disorder(s) or scored highly on a measure of anxiety in this review, there was no controlled research which looked at the effects of ABM on specific anxiety diagnoses. This was justified as the current standard of trials with paediatric anxiety is to include co-morbid disorders, due to the high rate of these in younger populations (Eldar et al., 2012). However, using a range of anxiety disorders and co-morbidities reduces the ability to measure if ABM is particularly useful with certain populations. Clearly, research into ABM in child and adolescent populations is still in its early stages but this may be where the research can develop. In doing so, researchers could also measure if disorder specific stimuli create a larger reduction in anxiety than generic threat stimuli. All of the studies used either angry or disgust facial pictorial over word stimuli, presumably due to the confounding effect of different reading abilities which are more apparent in younger populations. Previous research within adult populations has shown that word stimuli is more effective than pictorial stimuli (Hakamata et al., 2010). In addition, within adult populations, disorder specific stimuli has produced promising results, however this is perhaps more straightforward in this age group where word stimuli which can be adapted for specific worries can be used with greater ease (Amir et al., 2009a). In addition, one study used a non-anxious population (Eldar et al., 2008) and one study only included participants who demonstrated an attentional bias toward threat (Eldar et al., 2012). It is important to consider these factors when designing treatment protocols as there are a number of complications when assessing attentional bias; it has been found that differences in attentional bias in anxious and non-anxious populations are only moderate (Bar-Haim et al., 2007), and a significant group of anxious people do not demonstrate an

attentional bias. Again this highlights the unclear nature of the link between attentional bias and anxiety and therefore future researchers should consider individual differences in attentional bias within the research.

Conclusions regarding the long term effects of ABM training are also limited due to the fact that within the studies considered by this review, the longest follow up period was 2 weeks. This certainly limits the ability to comment on the lasting effects of ABM within this population; however, within adult populations, Amir et al. (2009b) showed that retention rates are still high after a four month follow up period.

#### *4.2 Limitations*

One limitation of the current review includes the choice to search only three electronic databases. This choice was made as these three databases were deemed to be the most relevant, and there was a confidence that appropriate papers were not missed through hand searching reference lists of other, similar papers. The review itself was written qualitatively and did not allow for quantitative analysis due to the methodological differences between the studies. To draw more definitive conclusions in the future, it would be necessary to carry out a systematic meta-analysis which would be contingent on further developments in the field with more rigorous testing of the intervention.

Quality ratings were also applied to the included studies in order to evaluate findings in terms of methodological quality. Issues were highlighted through this process and focused mainly on the absence of control groups in some studies. However, if the studies with low quality were removed, this would not change the overall outcome from the review. Although the general outcome suggested that ABM is a potentially effective treatment for anxiety, our results are constrained by the fact that there were only three randomised control trials and that the overall quality of the included papers also ranged within this review. This was not always directly related to the research design, as some papers not classed as randomised control trials showed sound methodological design. Most studies included a control group, and therefore allowed for randomisation and blinding, whereas some studies did not. This again limits the ability to attribute any positive effects to the

intervention, though it was decided to include all relevant pieces of research due to the novel and developing nature of this research.

### *5. Conclusions*

The overall results and implications for using ABM as an intervention for childhood anxiety are positive, however there are perhaps more questions unanswered at present. It would be helpful to develop the research in this area, and in particular with randomised control trials with larger samples. This would allow researchers to control for certain variables and create a greater understanding of the mechanism behind the relationship between attentional bias and anxiety.

As none of the included studies show long term follow-up data, researchers should consider this to measure the maintenance of gains from an ABM intervention. In addition, following the trend of the adult literature it would be beneficial to select and research specific anxiety disorders and include disorder specific stimuli. Other factors also need to be considered such as the optimal training frequency and length, and whether having ABM as an adjunct to CBT creates larger treatment gains than CBT or ABM alone. However, researchers have made an important start in this area which represents an exciting field whereby children and adolescents within typically difficult to engage populations may access therapy with greater ease.

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# **Attentional bias to respiratory and anxiety related threat in children with asthma**

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## **Abstract**

**Objective:** The objective of this study was to investigate attentional biases in children with asthma. The study aimed at replicating previous adult based research by testing whether children with asthma are vigilant to asthma and/or anxiety cues. In addition, it was tested whether this asthma related vigilance was linked to health associated factors which may indicate problems with managing the illness.

**Design/main outcome measures:** A total of 36 children aged 9-12 were included in the study. All children completed a computerised dot probe task designed to measure attentional bias to three different categories of words: asthma, anxiety symptom and general negative emotion. Main caregiver anxiety was also assessed, as were coping strategies, quality of life and frequency of inhaler use for those with asthma.

**Results:** Children with asthma showed an attentional bias toward asthma words but not anxiety or general negative emotion words. Children without asthma showed no significant attentional biases to any word categories. Caregiver anxiety was related to asthma word attentional bias in the asthma group.

**Conclusion:** Attentional bias is present in children with asthma and may suggest an unconscious threat association with the illness. Further research is required to ascertain if this exacerbates or maintains health related problems.

**Keywords:** Attentional bias, vigilance, asthma, children, anxiety

## **Introduction**

Asthma is a chronic respiratory disease which affects up to 30% of children worldwide (Pearce et al., 2007). The disease comprises episodes or attacks where breathing is affected, and the individual experiences symptoms such as a tight chest, wheezing, shortness of breath and coughing. Treatment typically involves attempting to reverse these symptoms, either concurrently with bronchodilators (commonly known as reliever inhalers), or over a consistent period with a prescription of corticosteroids (commonly known as preventer inhalers). This treatment can be an effective way of managing asthma, however research has shown that poor management of the illness is still a common occurrence in both child and adult populations (Demoly, Gueron, Annunziata, Adamek, & Walters, 2010). A range of reasons for poor control of asthma symptoms has been cited, for example the level of perceived self-efficacy or understanding of the illness (Dinwiddie & Müller, 2002; Rhee, Belyea, Ciurzynski, & Brasch, 2009). A significant problem in relation to the management of the illness is the inappropriate use of prescribed medication. Specifically, frequent or overuse of bronchodilators is recognised as an indicator of poor control and has been linked to recurrent use of health care facilities (Anis et al., 2001), exacerbated symptoms and even increased mortality (Anderson et al., 2005). The consensus is that asthma is a complex chronic condition and furthermore, the presence of comorbid psychological problems have been cited to contribute to difficulties in controlling and managing the illness (De Groot, Duiverman, & Brand, 2010).

Indeed, research has consistently found a positive relationship between childhood asthma and anxiety (Bussing, Burket, & Kelleher, 1996; Katon et al., 2007; Vuillermin et al., 2010). The aetiology of this anxiety is less certain, however what is known from general anxiety literature is that parental anxiety is suggested to be a factor in the development of childhood anxiety (Donovan & Spence, 2000). More specifically, and in relation to asthma, is that children with more anxious mothers report higher levels of anxiety and lower asthma related quality of life (Sales, Fivush, & Teague, 2008). Low quality of life is a consequence of the burden that physical illness can cause and furthermore, the comorbidity of psychological problems has been shown to be strongly associated to lower quality of life in children

with asthma (Vila et al., 2003). Further to this, Fernandes et al. (2010) suggested that high levels of anxiety can result in increased vigilance to asthma symptoms, greater use of asthma medication and lower quality of life. Medication is a treatment for asthma, but also a coping strategy which is employed to manage the illness; coping strategies are typically defined as either behavioural or cognitive strategies individuals employ to manage external or internal demands (Lazarus, 1993). Within adult asthma research, it has been shown that the type of coping strategy utilised has an effect on quality of life, where those who use more avoidant coping tend to have lower quality of life (Adams, Wilson, Smith, & Ruffin, 2004). Additionally, Lahaye, Fantini-Hauwel, Van Broeck, Bodart, and Luminet (2011) showed that paying greater attention to bodily symptoms of emotions was related to utilising the coping strategies of 'worrying' and 'ignoring' which resulted in lower quality of life in children with asthma. Findings have shown that the experience of asthma and subsequent use of medication and healthcare services is related to anxiety level rather than lung function (Fernandes et al., 2010), emphasising the powerful influence of anxiety to explain problems with asthma, regardless of actual physical impairment.

One area which has been proposed to explain this symptom exacerbation in asthma and which can be used to understand the link between asthma and psychological problems is cognitive processing. Research has shown that suggestion can have an effect on perceived symptoms: in an early study subjects were informed they were inhaling a bronchoconstrictor when a neutral saline substance was inhaled, and this suggestion was correlated with self-reported asthma symptoms (Isenberg, Lehrer, & Hochron, 1992). This has been replicated more recently where it was shown that participants who scored highly on a negative affectivity (NA) scale reported more asthma symptoms following suggestion (Put et al., 2004). NA refers to the tendency to experience negative emotions and has been strongly correlated to anxiety and depressive disorders (c.f Watson, Clark, & Carey, 1988). Following this, the researchers concluded that those who have asthma and high NA are hypervigilant to symptoms of asthma and have biased interpretations of bodily sensations.

Congruent with this research, it has also been shown that individuals with asthma can misconstrue panic symptoms as asthma symptoms which consequently can increase the rate of panic in youths with asthma (Goodwin, Pine, & Hoven,



2003). Similarly, within panic research it has been found that those with panic disorder show high rates of attention and vigilance to physical cues which can maintain the anxiety (Schmidt, Lerew, & Trakowski, 1997). This draws similarities with the findings from Put et al. (2004) regarding NA and hypervigilance in an asthma population. Due to the maintenance factor of attention to symptoms in anxiety disorders, hypervigilance is discouraged within psychological treatment (Westbrook, Kennerley & Kirk, 2007). Paradoxically, for an individual with asthma the nature of self-medicating with inhalers actually requires the individual to be vigilant to physical cues. Here, attention is something that is necessary for the management of asthma, but could also be a maintaining factor in problems with the illness. Adding to this is the suggestion that experiencing threat related vigilance may impede the ability to employ successful problem solving or coping strategies (Compas & Boyer, 2001).

The role of attention in the cause and maintenance of anxiety disorders has drawn considerable interest. Researchers have consistently shown that an individual's attention automatically orients to emotionally threatening information, the purpose of which is to allow a faster response to threat (Cisler & Koster, 2010). This has been measured as an attentional bias, and it has been shown that those who are anxious show a bias toward threat related stimuli (MacLeod, Mathews, & Tata, 1986). A well-researched technique to measure attentional biases which has been validated in both adult and child populations is the dot probe paradigm (MacLeod et al., 1986). In this computer paradigm, participants are asked to press a button when they see a dot appear on the screen. This dot either replaces neutral or threat stimuli and attentional bias is shown when the participant responds faster when the dot replaces the threat stimuli, indicating that the individual attends more to threat.

Attentional biases have been shown to be present in a range of psychiatric disorders such as social anxiety disorder (Asmundson & Stein, 1994) and obsessive compulsive disorder (Tata, Leibowitz, & Prunty, 1996). Researchers have increasingly become interested in how the cognitive processing of information may relate to maintenance of problems, such as anxiety and also health related difficulties. For example, Dehghani, Sharpe, and Nicholas (2003) showed that patients with chronic pain selectively attend to sensory pain words. They concluded

that a selective attention to, and a fixation on pain stimuli may be one factor which contributes to the chronicity of the problem. Research has not been confined to adults with health problems; Boyer et al. (2006) showed that children with recurrent abdominal pain showed patterns of attentional bias to pain related stimuli, which correlated with severity of pain. Overall, it has been suggested that the presence of an attentional bias to threat is a perpetuating factor which increases vigilance to perceived threat which can in turn increase anxiety levels (Asmundson & Stein, 1994). In relation to chronic health problems, hypervigilance to symptoms has also been linked with the maintenance of the illness (Dehghani et al., 2003).

There has been some research interest in how attentional bias may be related to problems within asthma populations (DePeuter, Lemaigere & Wan, 2007; Jessop, Rutter, Sharma, & Albery, 2004). Jessop et al. (2004) showed that adults with asthma demonstrated an increased bias for asthma related words compared to those without asthma and proposed that this denoted an 'emotional representation' of the illness. Furthermore, De Peuter et al. (2007) replicated this with an asthma group, albeit the group without asthma also demonstrated a bias for asthma related words. This unexpected finding was explained by a suggestion that the control group was 'primed' to asthma stimuli by the hospital setting of the research and so were vigilant to asthma cues. Nevertheless, it was concluded that individuals with asthma may demonstrate an emotional related concern focused on their illness, demonstrated with an attentional bias. Jessop et al. (2004) further showed that low adherers to inhaled preventative medication showed significantly greater bias for asthma words, and similarly high adherers showed a near significance in bias for asthma words. It was concluded that having an 'emotional representation' of asthma (denoted by bias to asthma words) could be used to understand either a problem with adherence or a tendency to adhere closely to the treatment regime (Jessop et al., 2004). No asthma related attentional bias research has been carried out in paediatric populations to the authors' knowledge, however, generally, attentional bias findings have been replicated in child and adolescent populations (Vasey & Daleiden, 1995). In terms of current research and clinical practice, an emphasis has been placed on targeting early interventions towards child and adolescent physical and mental health in order to

prevent the established trajectory into adulthood (Department of Health, 2011), and therefore building on research within younger populations meets this demand.

It is already recognised that there is an association between anxiety and asthma, however if a contributing factor to this in child populations is unconscious cognitive processing, establishing this could have clinical implications for the treatment of comorbid asthma and anxiety. Given that there is a determined link between experiencing asthma and panic related difficulties, it would be helpful to ascertain whether those with asthma show an attentional bias to panic related anxiety symptom cues, as well as asthma cues. Where Jessop et al. (2004) were interested in the use of the preventer inhaler, research has shown that bronchodilator medication (reliever inhaler) is commonly overused (Cole, Seale, & Griffiths, 2013), and that there can be serious health implications here (Anderson et al., 2005). The present study therefore sought to examine whether hypervigilance is related to inhaler use (are those who are more vigilant and sensitive to asthma cues more likely to use their inhaler?). Additionally, anxiety and attention has been related to lower quality of life and has been cited to impact coping strategies (Compas & Boyer, 2001; Vila et al., 2003). Childhood anxiety has also been related to caregiver anxiety (Donovan & Spence, 2000). Therefore, assessing these factors in the context of attentional biases is noteworthy, and is particularly important when considering clinical implications for the treatment of asthma and anxiety in child populations to allow for systemic, holistic interventions.

The primary aim of the study was to test the hypothesis that children with asthma would show a greater attentional bias to asthma and/or anxiety cues compared to those without asthma. Additionally, it was also hypothesised that there would be no attentional bias to words which are generally associated with negative emotions, suggesting that the attentional bias cannot be explained by a sensitivity to all emotional stimuli. The secondary aim was to ascertain if attentional bias was related to caregiver anxiety, inhaler use, coping strategies or quality of life.

## **Method**

### ***Design***

The study used a mixed design. Here, the between groups factor was asthma status (asthma vs. no asthma), and the within groups factor was threat word type (asthma vs. physical anxiety vs. general negative emotion). The dependent variable was the attentional bias score for each category of word.

### ***Participants***

18 children with asthma (14 male, 4 female) and 18 children without asthma (14 male, 4 female) participated in this research. The age range of the sample was between 108 and 150 months (i.e., 9-12 years). The participants with asthma were recruited from three hospital based asthma clinics within Scotland. The selection criteria for the participants in this group were that they (a) had a moderate to severe diagnosis of asthma (b) were prescribed a reliever inhaler (c) were aged 9-12 years at the time of the research (d) were free of any respiratory infection at the time of the research and (e) could read and write in English. Participants in the control group were recruited from a school in Scotland. The selection criteria for these participants were the same as the experimental group, apart from (a) and (b) where they did not have a diagnosis of asthma and did not use an inhaler. Both groups were matched as closely as possible on age, gender and ethnicity. A power analysis was carried out using G\*Power 3.1.7 (Faul, Erdfelder, Lang & Buchner, 2007) which indicated that in order to achieve a 0.8 level of power with a medium effect size ( $f=0.25$ ), for ANOVA 34 participants would be required across the two groups. Consideration of previous, related research showed that participant numbers ranged from 12-36 in each group (DePeuter et al., 2007; Hunt et al., 2007; Jessop et al., 2004; Vasey & Daleiden, 1995). It was therefore concluded that 18 in each group was sufficient. Each child's main caregiver also participated in the research.

Participant characteristics are displayed in the results section (Table 1). The two groups were matched in terms of gender ratio. There was also no significant difference between the groups in age,  $t(34)=0.38$ ,  $p=0.70$ , child ethnicity,  $\chi^2(1, N=36)=0.00$ ,  $p=1.00$ , parent ethnicity,  $\chi^2(1, N=36)=0.36$ ,  $p=0.55$ , or the amount of data removed due to incorrect responses or outliers  $t(34)=0.43$ ,  $p=0.67$ .

### ***Ethical approval***

The study was granted ethical approval by the South East Scotland Research Ethics Committee and each relevant NHS Health Board Research and Development department (see Appendices 4-8).

### ***Measures***

#### ***Dot Probe Task***

The dot probe is a measure of attentional bias as used in previous studies (MacLeod et al., 1986) and has been successfully replicated for use with children as young as seven years (Vasey & Daleiden, 1995). For each trial, a fixation cross appeared on the screen for 500 milliseconds (ms). This was then replaced by a word pair consisting of either a threat-neutral or a neutral-neutral pair. Threat words were those words which fell into asthma, anxiety symptom or general negative emotion categories. Words were presented with one word above the other for 1250ms at a distance of three cm apart (see Figure 1 for a visual representation of one trial). This presentation time is in line with suggested times for children to account for slower processing speeds compared to adults (Vasey & Daleiden, 1995). The response latencies were timed from the point that a probe in the shape of a dot appeared on the screen in place of either the top or the bottom word, until either the 'I' or the 'M' key was pressed, or after 3000ms. The 'I' key corresponded to the dot replacing the top word, and the 'M' key corresponded to the dot replacing the bottom word. After this time elapsed or a correct key was pressed, the participant was presented with another fixation cross before the next trial.

Both the threat word and the dot probe could appear in either the top position or bottom position in equal probability which gave rise to four conditions; probe upper-threat word upper, probe upper-threat word lower, probe lower-threat word lower, probe lower-threat word upper.

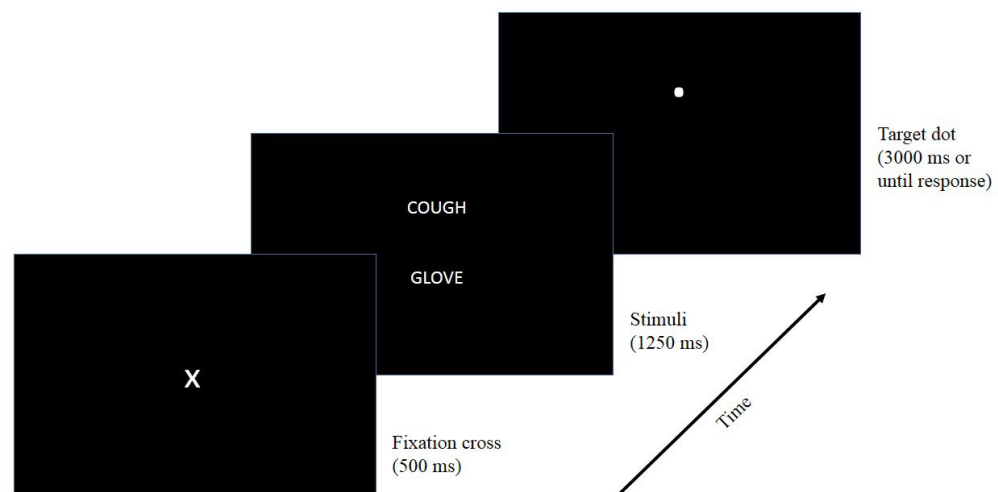


Figure 1. Example trial from the dot probe task

#### *Dot Probe Stimuli*

The stimuli consisted of 96 different word pairs, comprised of 48 neutral-neutral word pairs and 48 threat-neutral word pairs (see Appendix 15 for list). Of the 48 threat words there were three separate categories each made up of 16 words; physical anxiety symptom, asthma or general negative emotion words. In order to maximise testing, the 48 threat-neutral word pairs were repeated so they each occurred twice (Dehghani et al., 2003), giving 144 total trials. All word pairs were presented in a random order for each participant. The threat words were chosen from previous attentional bias research (Hunt, Keogh, & French, 2007; Jessop et al., 2004; Neshat-Doost, Moradi, Taghavi, Yule, & Dalgleish, 1999). Neutral words were selected to match the threat words on both word length and frequency (Brysbaert & New, 2009). For those words that had not been used in research with children of the same age range (asthma and neutral words), these were piloted in a primary school with ten nine year olds (see Appendix 16 for the pilot results). Words were only included in the study where 100% of the pilot sample could read them. These words were also cross referenced using an encyclopaedia of words which has been rigorously tested for reading level (Dale & O'Rourke, 1981). This was to ensure that the words used were readable for the school level of the youngest participants.

### *Quality of life*

Participants with asthma also completed the Paediatric Asthma Quality of Life Questionnaire (PAQLQ, Juniper et al., 1996). This is an asthma specific questionnaire aimed at measuring quality of life across three domains in children and adolescents aged seven years and above. The questionnaire has 23 items focused on symptoms, activity limitation and emotional function (Juniper et al., 1996). Responses are measured on a seven-point Likert scale indicating no impairment to maximum impairment. The overall score of quality of life is the mean of the item responses. Scores are also calculated from each domain in the same way and lower scores indicate more impairment. The questionnaire has been shown to have high internal reliability, with  $\alpha=0.95$  for overall quality of life for all participants (Juniper et al., 1996). Within this sample, the PAQLQ total was also shown to have high internal consistency,  $\alpha=0.96$ . The subscales of this measure also showed good reliability: 'symptoms' at  $\alpha=0.95$ , 'activity limitation' at  $\alpha=0.86$  and 'emotional functioning' at  $\alpha=0.93$ .

### *Coping strategies*

Participants with asthma completed the Coping with a Disease (CODI) questionnaire (Petersen, Schmidt, & Bullinger, 2004) to measure how they cope with their asthma. This questionnaire was specifically developed for use with children and adolescents aged eight and above to measure their coping strategies with chronic health conditions (Petersen et al., 2004). It was originally tested with a range of health conditions, including asthma. The questionnaire is a 28 item questionnaire with six different coping scales; acceptance, avoidance, cognitive-palliative, distance, emotional reaction and wishful thinking. These are each measured on a five-point Likert scale measuring from 'never' to 'always'. Each scale yields a score by summing all of the item scores, where higher scores are associated with a more frequent use of a strategy. The questionnaire has been shown to be a reliable measure of coping strategies with the scales ranging from  $\alpha=0.69$  to  $\alpha=0.83$  (Petersen et al., 2004). Within this sample, subscales showed a range of reliability with 'avoidance' showing good internal consistency at  $\alpha=0.81$ , similar to 'acceptance' at  $\alpha=0.77$  and

‘wishful thinking’ at  $\alpha=0.79$ . Other subsections showed lower internal consistency with ‘emotional reaction’ at  $\alpha=0.63$ , ‘distancing’ at  $\alpha=0.66$  and ‘cognitive-palliative’ at  $\alpha=0.55$ . A further analysis was carried out to assess whether deleting an item within the ‘cognitive-palliative’ scale would improve the reliability; this revealed that there would be no significant improvement upon deletion of any items, therefore no items were deleted.

#### *Inhaler use*

In order to measure use of the reliever inhaler, participants were given a self-report diary (c.f. Main, Moss-Morris, Booth, Kaptein & Kolbe, 2003). Participants were asked to complete this for a period of two weeks following the dot probe task and completion of the other measures. They were asked to indicate how many puffs of their blue (reliever) inhaler they had had each day. For each participant, a score was derived by summing the total amount of single uses of the inhaler which was used to provide an indication of the reliever inhaler frequency.

#### *Parental anxiety*

The main caregiver for each participant completed the Trait scale from the State-Trait anxiety inventory (STAI-Y2; Spielberger, Gorsuch & Lushane, 1970). State and trait anxiety are tested with separate questionnaires, each comprised of 20 items. Trait anxiety is stable and relates to personality and this scale has shown to have high levels of internal consistency; when measured across a sample of students, working adults and military employees, the median correlation coefficient was shown to be 0.90 (Spielberger & Sydeman, 1994). The STAI-Y2 also showed high internal consistency within this sample with  $\alpha=0.93$ .

#### *Procedure*

For the group with asthma, all potential participants were approached by the respiratory team at their current asthma clinic. This involved providing information about the research outlining the details and aims of the study and including details about participation being voluntary and confidential. Parental and child consent and/or child assent, where applicable were subsequently gained prior to participation.



The data were collected by the first author by conducting home visits. Here, participants completed the dot probe in a quiet room of their choice with the experimenter present. The dot probe was presented on a Sony Vaio E Series, Intel Inside CORE i5 15.5" laptop screen, and the participants were seated approximately 60cm from the screen (Hunt et al., 2007). The participants were instructed to watch the screen and press either the 'I' or the 'M' key depending on which word the dot replaced on the screen. They were also instructed to do this as quickly and accurately as possible. There were 10 practice trials, with the option to practise these trials again if necessary. Once the participants started the experimental trials, the task took 10 minutes to complete. After the participants had completed the dot probe, the children filled out the CODI and PAQLQ and main caregivers filled out the STAI-Y2. The experimenter then left the participants with the asthma diary to complete daily for the following two weeks and post back in a provided stamped, addressed envelope. This was explained to both the children and the caregivers in order to ensure understanding and maximise return of the diaries. Verbal consent was gained to follow up with a reminder phone call if this had not been received after three weeks.

For the control group, children and caregivers were given information about the research from their school and asked to indicate if they would be interested in taking part. Following this interest, their consent and assent was gained and the main caregiver was asked to fill out the STAI-Y2. Upon receiving this, the experimenter visited the school to conduct the dot probe with the consenting participants who met the inclusion criteria. This was completed in a quiet room with the same procedure as the experimental group excluding the use of the CODI, PAQLQ and asthma diary.

### ***Data screening***

#### ***Data reduction and analysis***

All analyses were conducted using SPSS 19.0. In line with previous child attentional bias studies, and in order to remove outliers, the data for each participant were screened and those response times of 200ms or less, or 1500ms or more were removed (Hunt et al., 2007). Incorrect responses were also removed. Removing

outliers and incorrect responses accounted for 2% (65 in total) of the total number of responses across all participants.

For each word type (asthma, anxiety symptom, general negative emotion), a separate repeated measures ANOVA was used to investigate the effect of the between factor of group (asthma, asthma free) and the within factors of word position (upper, lower) and dot position (upper, lower) on mean reaction times.

To investigate effects of group on word type further, the mean reaction times for each participant were used to calculate an attentional bias score for each type of threat word. This was achieved using a previously established formula which is common across dot probe research (c.f. Mogg, Bradley, Millar, & White, 1995).

$$\text{Attentional bias} = \frac{1}{2} ((\text{UpLn}-\text{UpUn})+(\text{LpUn}-\text{LpLn}))$$

Where U = upper position, L = lower position, p = probe, n = negative (or threat) word. Therefore, for example, UpLn equates to the mean score of when the probe is in the upper position and the threat word is in the lower position. The result of this formula is an attentional bias score for each word category. A positive score denotes an attentional bias towards that category of word and a negative score denotes a bias of attention away from the type of word. Correlational analyses were also conducted to investigate the relationships between the self-reported individual differences and the indices of attentional bias.

#### *Tests of assumptions of normality*

Initial analyses were performed to assess the distribution of the data in order to determine whether parametric tests were suitable. Histograms and PP plots were visually inspected to assess the normality of the data. Field (2005) suggests converting the skewness and kurtosis values into  $z$  scores in order to quantify normality by using numbers as well as a visual representation. Field (2005) further suggests that  $z$  scores for skewness or kurtosis above 2.58 (or below -2.58) is significant at the  $p<0.01$  level and subsequently the data are not suitable for analysing with parametric tests. Examinations of the  $z$  scores and showed that all variables apart from inhaler use and the 'wishful thinking' subscale of the CODI were normally distributed. The data for inhaler use were shown to have a non-normal distribution with a kurtosis of 3.83 ( $SE=1.04$ ) and the 'wishful thinking'

subscale of the CODI had a kurtosis of 2.72 ( $SE=1.04$ ). The scores were therefore transformed to provide a normal distribution to allow for parametric analyses. Transforming the 'inhaler use' scores corrected the distribution, however following transformation, the CODI 'wishful thinking' scores still displayed a non-normal distribution. Utilising a Spearman's Rho correlation with the CODI 'wishful thinking' scores provided similar results as a Pearson's correlation, and therefore parametric analyses were conducted across all of the data. Due to multiple correlations being made, the alpha level was adjusted to 0.01 to allow for a more stringent assessment of significance.

## **Results**

### ***Mean response latencies***

Mean response latencies and attentional bias scores by group and word type were calculated (Table 1). For asthma words, there was no significant difference between the asthma group ( $M=609.77$ ) and asthma free group ( $M=577.71$ ) for mean response latency (milliseconds)  $t(34)=0.59$ ,  $p=0.56$ ,  $d=0.20$ . This was similar for anxiety words (asthma group  $M=620.24$ , asthma free group  $M=565.08$ ),  $t(34)=1.15$ ,  $p=0.26$ ,  $d=0.39$  and general negative emotion words (asthma group  $M=632.75$ , asthma free group  $M=575.48$ ),  $t(34)=1.05$ ,  $p=0.30$ ,  $d=0.36$ .

A mixed ANOVA with group as a between groups factor and probe position and word position as repeated measures factors was conducted for each of the word types (asthma, anxiety and general negative emotion) separately. For asthma words, there was a significant effect of word position  $F(1,34)=5.10$ ,  $p=0.03$ ,  $d=0.77$ .

Reaction time was significantly quicker when the word appeared in the lower half of the display compared to when it appeared in the upper half (595.37ms vs. 603.79ms). This main effect was subsumed by a significant three-way interaction of group x word position x dot position  $F(1,34)=8.31$ ,  $p=0.01$ ,  $d=0.99$ . To investigate the interaction further, mean reaction times were considered for each group separately, using the same two within factors (word position, probe position). Within the asthma group, there was a main effect of word position  $F(1,17)=7.09$ ,  $p=0.02$ ,  $d=1.29$  with reaction time again being significantly quicker when the word appeared in the lower half of the display compared to the upper half (611.01ms vs. 638.74ms).

Table 1. Means of participant characteristics and attentional bias indices by group

	Asthma group <i>n</i> =18	Asthma free group <i>n</i> =18
Mean age in months (SD)	129.89 (13.90)	128.28 (11.20)
Gender ( <i>n</i> ;%)		
Males	14; 78.78	14; 78.78
Females	4; 22.22	4; 22.22
Child ethnicity ( <i>n</i> ;%)		
White British	17; 94.44	17; 94.44
Other	1; 5.56	1; 5.56
Parent ethnicity ( <i>n</i> ;%)		
White British	17; 94.44	16; 88.90
Other	1; 5.56	2; 11.10
Mean amount of removed data (SD)	1.94 (1.86)	1.67 (2.00)
Mean asthma words response latency (SD)	609.77 (160.11)	577.71 (168.56)
Mean anxiety words response latency (SD)	620.24 (131.95)	565.08 (155.88)
Mean gen. neg. emotion words response latency (SD)	632.75 (170.13)	575.48 (155.41)
Mean parent STAI-Y2 (SD)	38.94 (10.24)	30.28 (6.56)
Mean asthma bias (SD)	30.20 (43.57)	-6.83 (32.83)
Mean anxiety bias (SD)	5.71 (49.36)	0.19 (61.79)
Mean general negative emotion bias (SD)	1.39 (60.98)	-8.26 (47.02)

Note: Gen. neg.= general negative; STAI-Y2= State-Trait Anxiety Inventory, trait form

The two way interaction of word position x dot position was also significant  $F(1,17)=8.67, p=0.01, d=1.43$ . The quickest reaction times were shown when the dot appeared in the same location of the asthma word (598.94ms, 620.59ms), compared to when it appeared in the alternative half of the display (623.08ms, 656.89ms).

Within the asthma free group, there were no significant effects or interactions found.

Mixed ANOVA revealed no main effects or interactions for anxiety symptom words. For example, the group x word position x dot position interaction was not significant  $F(1,34)=0.09, p=0.77, d=0.10$ . Similarly, there were no main effects or interactions for general negative emotion words; the group x word position x dot position interaction was also not significant  $F(1,34)=0.28, p=0.60, d=0.18$ .

### ***Bias for asthma, anxiety and emotion***

To further investigate the nature of the effects found, mean response latencies were analysed using the previously mentioned formula to yield attentional bias scores (c.f.

Mogg, Bradley, Millar, & White, 1995). The asthma group had a higher attentional bias score for asthma words ( $M=30.20$ ) compared to those without asthma ( $M=-6.83$ ) and independent samples t-test was conducted for each word type. Bias scores for asthma words differed significantly between groups  $t(34)=2.88$ ,  $p=0.01$ ,  $d=0.99$ , however bias scores did not differ between groups for either anxiety words  $t(34)=0.30$ ,  $p=0.77$ ,  $d=0.10$  or general negative words  $t(34)=0.53$ ,  $p=0.60$ ,  $d=0.18$ .

To test the second hypothesis, bias scores were compared to 0 within the asthma group using a one sample t-test. This showed that children with asthma had an increased bias for asthma words  $t(17)=2.94$ ,  $p=0.01$ ,  $d=0.71$ , but not anxiety  $t(17)=0.49$ ,  $p=0.63$ ,  $d=0.02$  or general negative words  $t(17)=0.10$ ,  $p=0.92$ ,  $d=0.01$ .

In general attention bias literature, a bias score of five to ten milliseconds denotes the lower bound used as a cut off for attentional bias (Eldar et al., 2012). Congruent with this, the children without asthma showed no attentional bias for any word group; however the general negative attentional bias score was approaching what would be considered as an attentional avoidance.

### ***Caregiver anxiety and bias scores***

Caregivers of children with asthma were significantly more anxious than those of children without asthma  $t(34)=3.02$ ,  $p=0.01$ ,  $d=1.04$ . There was also a significant positive correlation between parental STAI-Y2 scores and asthma attentional bias in the asthma group ( $r=0.56$ ,  $p=0.01$ ), indicating that increased vigilance for asthma words was associated with greater caregiver anxiety. There were no significant correlations between caregiver anxiety and any category of bias scores in the group without asthma.

### ***Bias scores, quality of life, coping and inhaler use***

Pearson's correlational analyses were conducted between attentional bias indices, questionnaire variables and inhaler use for the group with asthma (Table 2). There were significant correlations found between subscales of individual questionnaires. For example, within the PAQLQ, 'activity limitation' was correlated with 'symptoms' ( $r=0.85$ ,  $p<0.01$ ), 'emotional functioning' ( $r=-0.71$ ,  $p<0.01$ ) and PAQLQ total ( $r=0.90$ ,  $p<0.01$ ).

Table 2. Correlations among attentional bias and questionnaire variables in the asthma group

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Asthma AB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Anxiety AB	-0.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Gen. Neg. Emot. AB	-0.48*	-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-
4. Caregiver STAI-Y2	0.57**	0.11	-0.42	-	-	-	-	-	-	-	-	-	-	-	-
5. CODI Avoidance	0.08	-0.26	-0.01	0.51*	-	-	-	-	-	-	-	-	-	-	-
6. CODI Cog. Pal.	0.06	0.37	0.24	0.23	0.02	-	-	-	-	-	-	-	-	-	-
7. CODI Emotion	-0.24	-0.13	0.28	0.00	-0.03	0.42	-	-	-	-	-	-	-	-	-
8. CODI Acceptance	-0.30	0.44	0.35	-0.22	-0.40	0.17	0.11	-	-	-	-	-	-	-	-
9. CODI Wishful thinking	-0.15	-0.09	0.16	0.15	0.23	0.03	0.39	0.09	-	-	-	-	-	-	-
10. CODI Distancing	0.44	0.27	-0.16	-0.05	-0.31	0.12	-0.51*	0.08	-0.57*	-	-	-	-	-	-
11. PAQLQ Symptoms	-0.01	-0.05	0.21	0.17	-0.15	-0.17	-0.15	0.17	-0.11	0.04	-	-	-	-	-
12. PAQLQ Act. Lim.	-0.10	-0.17	0.47	0.02	-0.19	0.03	-0.04	0.16	-0.27	0.12	0.85**	-	-	-	-
13. PAQLQ Emot. Func.	-0.05	-0.08	0.30	-0.14	-0.06	-0.27	-0.53*	0.15	-0.38	0.24	0.77**	0.71**	-	-	-
14. PAQLQ Total	-0.04	-0.09	0.30	0.04	-0.15	-0.19	-0.27	0.18	-0.26	0.12	0.96**	0.90**	0.90**	-	-
15. Inhaler use	-0.10	-0.11	0.21	-0.16	0.04	0.20	0.34	0.45	-0.20	0.14	-0.35	-0.13	-0.24	-0.27	-

Note: AB= attentional bias; Gen. Neg. Emot.= General negative emotion; STAI-Y2=State Trait Anxiety Inventory, Trait Form; CODI Cog. Pal= Coping with a Disease questionnaire, Cognitive Palliative scale; PAQLQ Act. Lim.= Pediatric Asthma Quality of Life Questionnaire, activity limitation scale; Emot. Func.=Emotional functioning scale. \* significant at  $p \leq 0.05$ , \*\* significant  $p \leq 0.01$

As the significance level was adjusted to allow for a more stringent analysis, a number of correlations were significant but not to the 0.01 level. Attentional bias to general negative emotion words was negatively correlated to attentional bias to asthma words ( $r=-0.48, p<0.05$ ). This indicated that those who demonstrated an avoidance of general negative emotion words showed higher levels of vigilance for asthma words. In addition, PAQLQ 'emotional functioning' subscale was negatively correlated to the CODI 'emotional reaction' subscale ( $r=-0.53, p<0.05$ ), indicating that those whose quality of life were more affected by emotions tended to cope with their illness by using negative emotions.

In addition, a number of correlations were approaching levels of significance. For example, a higher score on the CODI 'acceptance' subscale was associated with vigilance for anxiety words and a lower score was associated with an avoidance of anxiety words ( $r=0.44, p=0.07$ ). Using 'distancing' as a coping strategy was associated with vigilance for asthma words ( $r=0.44, p=0.07$ ). Feeling less limited in terms of ability to join in with activities (PAQLQ 'activity limitation'), was associated with vigilance for general negative emotion words, and feeling more impaired was associated with an avoidance ( $r=0.47, p=0.05$ ).

There were no significant correlations between inhaler use and any other factors, however there was a correlation approaching significance between inhaler use and CODI 'acceptance' ( $r=0.45, p=0.06$ ).

## **Discussion**

The purpose of this study was to test if children with asthma selectively attend to either asthma or anxiety related cues. It was hypothesised that this group of participants would show a bias for asthma and anxiety cues over participants without a diagnosis of asthma but that they would not show a bias toward general negative emotion words. In addition, given the suggested link between anxiety, quality of life and coping strategies, the secondary aim of the study was to measure any relationship between attentional bias and these variables.

The first hypothesis was partially supported; children with asthma selectively attended to asthma cues whereas those without asthma did not. However, neither the asthma nor asthma free group selectively attended to the anxiety related words at a

significant level. It was also shown that although the asthma group showed a bias toward asthma related words, they did not selectively attend toward general negative emotion words, demonstrating that their bias could not be explained by a general vigilance to emotional stimuli. The presence of an attentional bias in the asthma group replicates findings from previous adult research (DePeuter et al., 2007; Jessop et al., 2004). Within their study, Jessop et al. (2004) concluded that selective attention to asthma cues denotes an ‘emotional representation’ of the illness which could not be measured by self-report mood based questionnaires. They further found that this was related to low adherence to preventative medication, and a nearly significant association with high adherence to medication regime. They suggested that having an ‘emotional representation’ of the illness could be either a motivating factor to adhere to treatment regimes, or a factor which could interfere with adherence. DePeuter et al. (2007) also found that high vigilance to asthma words in the asthma group was related to high negative affectivity (NA); a factor which has been related to anxiety. This finding is interesting in light of the previously mentioned research by Put et al. (2004) who found that high NA was related to hypervigilance following suggestion. Given a recurrent finding of attentional biases in asthma populations, it is important to consider the implications of this. Generally, selective attention is proposed as an adaptive cognitive function manifested due to a perception of anxiety and threat (Cisler & Koster, 2010). The children with asthma in this sample unconsciously detected threat in asthma related information and the presence of an attentional bias to relevant health related stimuli suggests a concern surrounding the illness which is emotionally entrenched.

It is possible that instead of a perception of threat surrounding the asthma words, participants with asthma were displaying an attentional bias due to the familiarity and frequency of exposure to such stimuli. Previous research reports that this is not the case; within the study by Jessop et al. (2004), the researchers showed that there was no significant difference between an asthma primed and non-primed group, concluding that recent encounters and contemplation about asthma stimuli did not affect attentional bias. In addition, recent trials where attention has been modified away from threat stimuli has shown positive effects on anxiety levels (Bar-Haim, Morag, & Glickman, 2011; Eldar et al., 2012; Shechner et al., 2014).



Subsequently, participants also show a reduction in attentional bias to threat words. If attentional bias is related to familiarity instead of anxiety, these results would not be expected.

Although a bias toward asthma words was demonstrated within this study, there were no significant relationships with the measured health-related variables such as quality of life, coping strategies or reliever inhaler use. If vigilance to asthma cues is a problem or maintenance factor within the illness, it would be expected that this would be related to negative health related behaviours. This was not demonstrated here, however it may be that the particular outcomes captured within this study were too narrow to demonstrate any problems. Additionally, the current sample did not purposefully include clinical levels of anxiety and so previously established links between anxiety and quality of life (Vila et al., 2003) may not have been replicated for this reason. Furthermore, the sample size was small for correlational analyses and therefore underpowered for these comparisons; a number of correlations yielded promising levels yet did not reach significance (i.e.  $r=0.44$ ), which may have been different in a larger sample. It may also have been helpful to measure adherence to preventer medication as within the study by Jessop et al. (2004); this would have perhaps been a more specific capture of health related behaviours due to the prescribed nature of the dosage. However, as the research sample was taken from specialised asthma clinics and all children had a moderate to severe diagnosis of asthma, it can be assumed that the population in this study had additional problems with their illness, over and above the general asthma population. It has been stated that as many as nine out of ten patients with asthma are treated within primary care (c.f. Baishnab & Karner, 2012) and it would therefore be helpful to replicate the research including both secondary and primary care managed patients (mild asthma vs severe asthma). This would confirm if an attentional bias and therefore perceiving threat in the illness is related to severity and complexity of the health problem.

There was an absence of a significant attentional bias toward anxiety related words in this research, however the bias score was positive and was approaching what would be considered significant. It was thought that due to the higher incidence of panic related anxiety within asthma populations (Goodwin et al., 2003), children

with asthma may be more vigilant to anxiety symptom cues which in turn may correlate to the amount they use their reliever inhaler. In terms of anxiety, the stimuli used were disorder specific, and previous research with children and adolescents has shown that attentional biases in youths can be related to specific worries (Moradi, Taghavi, Neshat Doost, Yule, & Dalgleish, 1999). It has however been suggested that content specific attentional biases vary with age and clinical status as fear will increase through exposure (Hunt et al., 2007). Naturally, older individuals will have experienced more exposure to feared situations and would subsequently be more susceptible to content specific attentional biases. An attentional bias to anxiety symptom stimuli may not have been demonstrated given that this research used a non-clinical (anxiety), younger child sample compared to that of Moradi et al. (1999). The anxiety related words may also not have held adequate threat value to capture attention, or likewise may not have been sufficiently associated with the actual somatic feeling of panic. The same set of anxiety threat words were developed and utilised in a previous piece of research where an attentional bias was found to all emotional stimuli in children with high anxiety sensitivity, demonstrating a non-specific emotional attentional bias (Hunt et al., 2007). It is also plausible that this population did not have sufficient levels of panic related anxiety to demonstrate a disorder specific attentional bias. Including an anxiety related self-report measure may have been helpful to clarify this and would also have shown whether or not attentional bias could be captured by conventional anxiety questionnaires which would have allowed further replication of the study by Jessop et al. (2004).

A further finding was that those in the asthma group had caregivers with significantly higher levels of anxiety, measured by the STAI-Y2 than those in the asthma free group. It is not possible to comment upon causality here and it is important not to place too much emphasis on this due to the fact that parents of children with chronic illnesses would be expected to have higher stress levels due to the burden of the illness on the family (Cousino & Hazen, 2013). However, this finding does replicate previous research (Brook, 1991), and explanations for this finding have been that parental anxiety impacts on how well the asthma can be managed; those with severe, less well managed asthma have more anxious parents

(Staudenmayer, 1981). Conversely, Cookson et al. (2009) found that mother's prenatal anxiety can directly lead to their child developing asthma which would suggest that children of higher anxious mothers may be more likely to developing the illness. There is not one universal viewpoint on the relationship between parental anxiety and childhood asthma, however a link has been established.

Furthermore, within the asthma group in this study, higher levels of parental anxiety were related to increased vigilance for asthma related words in the children. Although this effect was found with asthma words and not anxiety words, this finding could be interpreted in line with previous research investigating the relationship between parental and child anxiety. If the attentional bias to asthma words demonstrates an emotional concern surrounding the illness, then it could be suggested that this is related to anxiety at some level. Again, including a measure of child anxiety may have helped with this interpretation. Much of the research into child and parental anxiety discusses the powerful influence of modelling from caregivers, and the anxiety inducing consequence of children receiving negative information from their caregivers. Field (2006) showed that after receiving negative information about novel animals, children demonstrated an attentional bias for this animal on the dot probe task. It has also been shown that children and adolescents of caregivers with a diagnosis of Posttraumatic Stress Disorder (PTSD) displayed an attentional bias to PTSD related threat words compared to control participants whose parents had no diagnosis (Moradi, Neshat-Doost, Toghiani, Yule, & Dalgleish, 1999). Furthermore, adults with high levels of trait anxiety are more likely to perceive ambiguous situations as threatening (Eysenck, Mogg, May, Richards, & Mathews, 1991), and therefore perhaps higher anxious caregivers may interpret asthma indicators increasingly negatively. Taken into context within this research, if children are receiving negative messages about their asthma from their caregivers, this may increase their attentional biases for asthma related stimuli. This needs to be verified in further research and could be achieved by assessing a relationship between variables such as parental attitudes towards their child's asthma and attentional bias.

### ***Limitations***

This piece of research is not without its limitations. One clear limitation is the reliance on self-report data, particularly with measuring inhaler use. Self-report asthma diaries have been subjected to criticism due to patient burden or social desirability affecting reliability (c.f. Milgrom et al., 1996), though it has also been shown that inhaler diaries can be as accurate as less subjective measures (Butz, Donithan, Bollinger, Rand, & Thompson, 2005). Self-report diaries were chosen to limit access to patient notes, however a more accurate measure could have been taking account of prescription refills of the reliever inhaler over a period of time with consent of the participants. In order to reduce participant burden and increase reliability and compliance, the amount of data required of the participants was kept as brief as possible and the diaries were fully explained to both the children and caregiver. In addition to the asthma diary, the child participants were required to self-report on quality of life and coping strategies. These measures were specifically designed for children and so have been validated with this age range, however self-report questionnaires are always subjected to problems with social desirability response biases (Mortel, 2008). It may have been helpful to embed a social desirability scale into the battery of measures. Despite these limitations, a strength of the measures used were that they were either disorder specific (PAQLQ) or had been developed with the use of an asthma population (CODI).

The dot probe paradigm was chosen over other previously used measures such as the emotional Stroop paradigm, as it has been suggested that the dot probe task is the most effective at this age range in investigating attentional biases (Daghighi et al., 2003). Nevertheless, the dot probe has been criticised as it does not allow for a differentiation of whether attention is captured or whether there is a difficulty in disengaging from the stimuli. In addition, within adult attentional bias research, a 'vigilance-avoidance' hypothesis has been proposed where stimuli which are displayed for a prolonged latency (i.e. 1500ms) encourage individuals to avert their attention away, whereas vigilance is best captured at shorter presentation times (Mogg, Bradley, Miles, & Dixon, 2004). This may have implications for research within child populations, as it is recommended to extend the stimulus presentation time to account for less mature processing speed (Vasey & Daleiden, 1995). This

‘vigilance-avoidance’ pattern is not yet understood in children and adolescents, however in research with younger populations it may be particularly useful to use subliminal presentation of stimuli to ascertain if there is a difference in attentional bias depending on presentation times. Additionally, to take account for less developed executive functioning, it has been suggested that including relevant assessments such as the Test of Everyday Attention for Children (TEA-ch; Manly & Anderson, 2001) would allow for an assessment of the relationship between attentional bias and cognitive capacity (Puliafico & Kendall, 2006).

In order to enhance the reliability of the words used in this research, the participants could have been required to read all of the words after completing the dot probe. This would have ensured that all children could read the included words thus reducing potential confounding from different reading abilities. This was not carried out within this research with the aim of reducing participant burden. Similarly, a test of reading abilities was not included for the same reason. It was thought that in piloting the included words with children who had different reading levels, and cross referencing with a well utilised encyclopedia (Dale & O’Rourke, 1981), there could be a certain amount of confidence that the children would not have significant reading related problems with the included words.

Finally, this study is unlikely to have sufficient statistical power for detecting effects in the correlational analyses. As such, it is important to interpret these results as preliminary investigations into the subject area, and a replication of the findings with larger sample sizes would be indicated for future research. In addition, within the CODI, the internal consistency was particularly low on the ‘cognitive-palliative’ scale. Given any significant correlations, these results would have to have been interpreted with caution.

### ***Clinical Implications***

Previous, similar research has proposed that when designing interventions for problems with medication adherence in asthma populations, it is important to take into account anxiety, which may not be detected by self-report measures (Jessop et al., 2004). Furthermore, it was advised that some models used for increasing positive health behaviours may actively draw an individual’s attention to the perceived threat

of an asthma attack, which may be unhelpful if attentional bias is a maintenance factor for chronicity in the illness. Further research within child populations is required to confirm this.

However, it may be helpful to modify attention to perceived threatening cues; an intervention which is currently being tested with child anxiety populations (c.f. Shechner et al., 2014). As mentioned previously, the nature of the necessity of vigilance in order to self-medicate for asthma symptoms makes reducing this attention less straightforward. However, distinguishing a boundary between helpful and unhelpful levels of vigilance with skilled clinicians could prove helpful for children with asthma in order to reduce the perpetuating nature of attention, anxiety and health related problems.

A clear finding from this research was the relationship between parental anxiety and attentional biases. As such, as far as possible it may be helpful to assess and implement systemic approaches to reduce parental or familial anxiety when supporting a child with complex asthma.

### ***Conclusion***

This research further proposes that considerations of emotional factors are vital within chronic or complex health conditions. In addition, considering that vigilance has been cited as a maintenance factor for both psychiatric and health problems, it would be important to consider this and caregiver anxiety when designing interventions to manage asthma in paediatric populations.

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### **Conflict of interest**

The authors have no conflicts of interest to declare.

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## **Appendices**

Appendix 1: Author guidelines for systematic review (Journal of Affective Disorders)

Appendix 2: Quality Criteria for systematic review

Appendix 3: Author guidelines for research article (Psychology and Health)

Appendix 4: REC favourable opinion letter

Appendix 5: NHS Borders Research and Development favourable opinion letter

Appendix 6: NHS Lothian Research and Development favourable opinion letter

Appendix 7: NHS Fife Research and Development favourable opinion letter

Appendix 8: REC major amendment favourable opinion letter

Appendix 9: Participant information sheet, children without asthma

Appendix 10: Participant information sheet, parents of children without asthma

Appendix 11: Participant information sheet, children with asthma

Appendix 12: Participant information sheet, parents of children with asthma

Appendix 13: Cover letter to potential participants

Appendix 14: Permission to use the State-Trait Anxiety Inventory

Appendix 15: Dot probe threat word stimuli

Appendix 16: Pilot word testing results

## Appendix 1.

### Author guidelines for systematic review (Journal of Affective Disorders)

#### Guide for Authors

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## Appendix 2.

### Quality Criteria (Downs and Black, 1998)

#### *Checklist for measuring study quality*

##### **Reporting**

1. *Is the hypothesis/aim/objective of the study clearly described?*

yes 1, no 0

2. *Are the main outcomes to be measured clearly described in the Introduction or Methods section?*

If the main outcomes are first mentioned in the Results section, the question should be answered no.

yes 1, no 0

3. *Are the characteristics of the patients included in the study clearly described?*

In cohort studies and trials, inclusion and/or exclusion criteria should be given. In case-control studies, a case-definition and the source for controls should be given.

yes 1, no 0

4. *Are the interventions of interest clearly described?*

Treatments and placebo (where relevant) that are to be compared should be clearly described.

yes 1, no 0

5. *Are the distributions of principal confounders in each group of subjects to be compared clearly described?*

A list of principal confounders is provided

yes 2, partially 1, No 0

6. *Are the main findings of the study clearly described?*

Simple outcome data (including denominators and numerators) should be reported for all major findings so that the reader can check the major analyses and conclusions.

(This question does not cover statistical tests which are considered below).

yes 1, no 0

7. *Does the study provide estimates of the random variability in the data for the main outcomes?*

In non-normally distributed data the inter-quartile range of results should be reported. In normally distributed data the standard error, standard deviation or confidence intervals should be reported. If the distribution of the data is not described, it must be assumed that the estimates used were appropriate and the question should be answered yes.

yes 1, no 0

8. *Have all important adverse events that may be a consequence of the intervention been reported?*

This should be answered yes if the study demonstrates that there was a comprehensive attempt to measure adverse events. (A list of possible adverse events is provided).

yes 1, no 0

*9. Have the characteristics of patients lost to follow-up been described?*

This should be answered yes where there were no losses to follow-up or where losses to follow-up were so small that findings would be unaffected by their inclusion. This should be answered no where a study does not report the number of patients lost to follow-up.

yes 1, no 0

*10. Have actual probability values been reported (e.g. 0.035 rather than <0.05) for the main outcomes except where the probability value is less than 0.001?*

yes 1, no 0

**External validity**

All the following criteria attempt to address the representativeness of the findings of the study and whether they may be generalised to the population from which the study subjects were derived.

*11. Were the subjects asked to participate in the study representative of the entire population from which they were recruited?*

The study must identify the source population for patients and describe how the patients were selected. Patients would be representative if they comprised the entire source population, an unselected sample of consecutive patients, or a random sample.

Random sampling is only feasible where a list of all members of the relevant population exists. Where a study does not report the proportion of the source population from which the patients are derived, the question should be answered as unable to determine.

yes 1, no 0, unable to determine 0

*12. Were those subjects who were prepared to participate representative of the entire population from which they were recruited?*

The proportion of those asked who agreed should be stated. Validation that the sample was representative would include demonstrating that the distribution of the main confounding factors was the same in the study sample and the source population.

yes 1, no 0, unable to determine 0

*13. Were the staff, places, and facilities where the patients were treated, representative of the treatment the majority of patients receive?*

For the question to be answered yes the study should demonstrate that the intervention was representative of that in use in the source population. The question should be answered no if, for example, the intervention was undertaken in a specialist centre unrepresentative of the hospitals most of the source population would attend.

yes 1, no 0, unable to determine 0, N/A 0

**Internal validity - bias**

*14. Was an attempt made to blind study subjects to the intervention they have received?*

For studies where the patients would have no way of knowing which intervention they received, this should be answered yes.

yes 1, no 0, unable to determine 0, N/A 0

15. *Was an attempt made to blind those measuring the main outcomes of the intervention?*

yes 1, no 0, unable to determine 0, N/A 0

16. *If any of the results of the study were based on “data dredging”, was this made clear?*

Any analyses that had not been planned at the outset of the study should be clearly indicated. If no retrospective unplanned subgroup analyses were reported, then answer yes.

yes 1, no 0, unable to determine 0

17. *In trials and cohort studies, do the analyses adjust for different lengths of follow-up of patients, or in case-control studies, is the time period between the intervention and outcome the same for cases and controls?*

Where follow-up was the same for all study patients the answer should be yes. If different lengths of follow-up were adjusted for by, for example, survival analysis the answer should be yes. Studies where differences in follow-up are ignored should be answered no.

yes 1, no 0, unable to determine 0

18. *Were the statistical tests used to assess the main outcomes appropriate?*

The statistical techniques used must be appropriate to the data. For example nonparametric methods should be used for small sample sizes. Where little statistical analysis has been undertaken but where there is no evidence of bias, the question should be answered yes. If the distribution of the data (normal or not) is not described it must be assumed that the estimates used were appropriate and the question should be answered yes.

yes 1, no 0, unable to determine 0

19. *Was compliance with the intervention/s reliable?*

Where there was noncompliance with the allocated treatment or where there was contamination of one group, the question should be answered no. For studies where the effect of any misclassification was likely to bias any association to the null, the question should be answered yes.

yes 1, no 0, unable to determine 0

20. *Were the main outcome measures used accurate (valid and reliable)?*

For studies where the outcome measures are clearly described, the question should be answered yes. For studies which refer to other work or that demonstrates the outcome measures are accurate, the question should be answered as yes.

yes 1, no 0, unable to determine 0

### ***Internal validity - confounding (selection bias)***

21. *Were the patients in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited from the same population?*

For example, patients for all comparison groups should be selected from the same hospital. The question should be answered unable to determine for cohort and case control studies where there is no information concerning the source of patients included in the study.

yes 1, no 0, unable to determine 0, N/A 0

22. *Were study subjects in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited over the same period of time?*

For a study which does not specify the time period over which patients were recruited, the question should be answered as unable to determine.

yes 1, no 0, unable to determine 0, N/A 0

23. *Were the groups similar at baseline in terms of important characteristics?*

Characteristics include age, sex, anxiety severity or diagnosis?

yes 1, no / not tested 0, unable to determine 0, N/A 0

24. *Were study subjects randomised to intervention groups?*

Studies which state that subjects were randomised should be answered yes except where method of randomisation would not ensure random allocation. For example alternate allocation would score no because it is predictable.

yes 1, no 0, unable to determine 0, N/A 0

25. *Was the randomised intervention assignment concealed from both patients and staff who came into contact with the patients until recruitment was complete and irrevocable?*

All non-randomised studies should be answered no. If assignment was concealed from patients but not from staff, it should be answered no.

yes 1, no 0, unable to determine 0, N/A 0

26. *Was there adequate adjustment for confounding in the analyses from which the main findings were drawn?*

This question should be answered no for trials if: the main conclusions of the study were based on analyses of treatment rather than intention to treat; the distribution of known confounders in the different treatment groups was not described; or the distribution of known confounders differed between the treatment groups but was not taken into account in the analyses. In nonrandomised studies if the effect of the main confounders was not investigated or confounding was demonstrated but no adjustment was made in the final analyses the question should be answered as no.

yes 1, no 0, unable to determine 0

27. *Were losses of patients to follow-up taken into account?*

If the numbers of patients lost to follow-up are not reported, the question should be answered as unable to determine. If the proportion lost to follow-up was too small to affect the main findings, the question should be answered yes.

yes 1, no 0, unable to determine 0

### **Power**

28. *Did the study have sufficient power to detect a statistically significant effect?*

yes 1, no 0, unable to determine 0

## Appendix 3.

### Author guidelines for research article (Psychology and Health)

#### Manuscript preparation

##### 1. General guidelines

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- Manuscripts should be compiled in the following order: title page; abstract; keywords; main text; acknowledgements; references; appendices (as appropriate); table(s) with caption(s) (on individual pages); figure caption(s) (as a list).
- Abstracts of 200 words are required for all manuscripts submitted. If using a structured abstract the primary headings should be: Objective, Design, Main Outcome Measures, Results, Conclusion.
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## Full details of our Open Access programme

Last updated 14/02/2014

## Appendix 4.

### REC Favourable opinion letter

#### Lothian NHS Board

#### South East Scotland Research Ethics Committee 01



Waverley Gate  
2-4 Waterloo Place  
Edinburgh  
EH1 3EG  
Telephone 0131 538 9000  
Fax 0131 465 5789

[www.nhslothian.scot.nhs.uk](http://www.nhslothian.scot.nhs.uk)

Date 26 February 2013  
Your Ref  
Our Ref

Mrs Helen Lowther  
NHS Borders  
Andrew Lang Unit,  
Selkirk  
Scottish Borders  
TD7 4LJ

Enquiries to: Sandra Wyllie  
Extension: 35473  
Direct Line: 0131 465 5473  
Email: [Sandra.Wyllie@nhslothian.scot.nhs.uk](mailto:Sandra.Wyllie@nhslothian.scot.nhs.uk)

Dear Mrs Lowther

<b>Study title:</b>	<b>Selective attention to anxiety symptom cues in children with asthma and the relationship with adherence</b>
<b>REC reference:</b>	<b>13/SS/0013</b>
<b>Protocol number:</b>	<b>n/a</b>
<b>IRAS project ID:</b>	<b>114660</b>

Thank you for your letter of 24 February 2013, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information was considered in correspondence by a sub-committee of the REC. A list of the sub-committee members is attached.

We plan to publish your research summary wording for the above study on the NRES website, together with your contact details, unless you expressly withhold permission to do so. Publication will be no earlier than three months from the date of this favourable opinion letter. Should you wish to provide a substitute contact point, require further information, or wish to withhold permission to publish, please contact the Co-ordinator Mrs Sandra Wyllie, [Sandra.Wyllie@nhslothian.scot.nhs.uk](mailto:Sandra.Wyllie@nhslothian.scot.nhs.uk).

#### Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

#### Ethical review of research sites

##### NHS sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).



INVESTORS  
IN PEOPLE



Healthy  
Working  
Lives

Headquarters  
Waverley Gate, 2-4 Waterloo Place, Edinburgh EH1 3EG

Chair Dr Charles J Winstanley  
Interim Chief Executive Tim Davison  
*Lothian NHS Board is the common name of Lothian Health Board*

## Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study:

- Only words that 100% of the pilot child sample can read will be included in the research.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

*Management permission ("R&D approval") should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements.*

Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at <http://www.rdforum.nhs.uk>.

*Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.*

*For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.*

*Sponsors are not required to notify the Committee of approvals from host organisations*

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

You should notify the REC in writing once all conditions have been met (except for site approvals from host organisations) and provide copies of any revised documentation with updated version numbers. The REC will acknowledge receipt and provide a final list of the approved documentation for the study, which can be made available to host organisations to facilitate their permission for the study. Failure to provide the final versions to the REC may cause delay in obtaining permissions.

## Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	Version	Date
Other: CV - H. Lowther		
Other: CV - Dr E Newman		
Other: CV - Dr J Cossar		
Other: GP letter	gp_01	12 December 2012
Other: Asthma Diary		
Participant Consent Form: Assent Form	ch_1	12 December 2012
Participant Consent Form: Child with asthma - over 10	ch_ex_01	12 December 2012
Participant Consent Form: Child without asthma - over 10	ch_cont_01	12 December 2012
Participant Consent Form: Parent - for their own participation	par_01	12 December 2012



Participant Consent Form: Parent of child under 10 with asthma	par_ex_01	12 December 2012
Participant Consent Form: Parent of child under 10 without asthma	par_cont_01	12 December 2012
Participant Information Sheet: Children with asthma group	ch_ex_02	12 February 2013
Participant Information Sheet: Children without asthma group	ch_cont_02	12 February 2013
Participant Information Sheet: Parent of children with asthma	par_ex_02	12 February 2013
Participant Information Sheet: Parent of children with out asthma	par_con_02	12 February 2013
Protocol	Version 02	12 February 2013
Questionnaire: PAQLQ		
Questionnaire: State-Trait Anxiety Inventory		
Questionnaire: CODI		
REC application		22 January 2013
Response to Request for Further Information		24 February 2013

#### Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

#### After ethical review

##### Reporting requirements

The attached document "*After ethical review – guidance for researchers*" gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study

The NRES website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

##### Feedback

You are invited to give your view of the service that you have received from the National Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the website.

Further information is available at National Research Ethics Service website > After Review

13/SS/0013	Please quote this number on all correspondence
------------	--

We are pleased to welcome researchers and R & D staff at our NRES committee members' training days – see details at <http://www.hra.nhs.uk/hra-training/>

With the Committee's best wishes for the success of this project.

Yours sincerely



pp  
Dr Janet Andrews  
Chair

Email: Sandra.Wyllie@nhslothian.scot.nhs.uk

*Enclosures:*      *List of names and professions of members who were present at the meeting and those who submitted written comments.*  
                               *"After ethical review – guidance for researchers"*

*Copy to:*              *Marianne Laird*  
                               *Ms Karen Maitland, NHS Lothian Research & Development Office*

# **South East Scotland Research Ethics Committee 01**

## **Attendance at Sub-Committee of the REC**

### **Committee Members:**

Name	Profession	Present	Notes
Mr Lindsay Murray	Health & Safety Manager	Yes	
Dr Kevin Smith	Biochemist	Yes	

### **Also in attendance:**

Name	Position (or reason for attending)
Mrs Sandra Wyllie	Committee Co-ordinator

## Appendix 5.

### NHS Borders Research and Development favourable opinion letter

#### NHS Borders

Research Administration  
Clinical Governance & Quality

Mrs Helen Lowther  
Trainee Clinical Psychologist  
NHS Borders

Clinical Governance  
& Quality  
Borders General  
Hospital  
Melrose  
Roxburghshire TD6 9BS

Telephone 01896

Date 27 August 2014

Our Ref 12/BORD/29

Enquiries to Joy Borowska  
Extension 01896 826717  
Email



[research.governance@borders.sco](mailto:research.governance@borders.sco)

Dear Mrs Lowther

#### **NRS13/ PE57: Selective attention to anxiety symptom cues in children with asthma and the relationship with adherence.**

Thank you for sending details of your study to NHS Borders. I can confirm that the Research Governance Committee has reviewed the documentation, and on this basis I am pleased to inform you that this study has management approval for commencement within NHS Borders.

It is a condition of approval that everyone involved in this study abides by the guidelines/protocols implemented by NHS Borders with respect to confidentiality and Research Governance. It is your responsibility to ensure that you are familiar with these, however please do not hesitate to seek advice if you are unsure.

**Please advise the R&D Office immediately of any changes to the project such as amendments to the protocol, recruitment, funding, personnel or resource input required of NHS Borders. Please also advise the R&D office when recruitment has been completed and when the study has been fully completed.**

Amendments to the protocol will require approval from the ethics committee that approved your study. Please inform this office when recruitment has closed and when the study has been completed. Please quote the reference number stated above in all correspondence.

May I take this opportunity to wish you every success with your project? Please do not hesitate to contact the R&D Office should you require any further assistance.

Yours sincerely

A handwritten signature in black ink that reads "Thomas Cripps". The script is cursive and fluid, with the first name "Thomas" and the last name "Cripps" clearly legible.

Thomas Cripps  
Associate Medical Director (Clinical Governance)

CC NRSCC

Dr Andrew Duncan, NHS Borders



## Appendix 6.

### NHS Lothian Research and Development favourable opinion letter

#### University Hospitals Division

Queen's Medical Research Institute  
47 Little France Crescent, Edinburgh, EH16 4TJ

07555/Sup 0001

06 May 2013

Ms Ann McMurray  
Royal Hospital for Sick Children  
Scotmas Road  
Edinburgh  
EH9 1LE



Research & Development  
Room E1.12  
Tel: 0131 242 3330  
Fax: 0131 242 3343

Email: [R&DOffice@uhLothian.nhs.uk](mailto:R&DOffice@uhLothian.nhs.uk)

Director: Professor David E Newby

Dear Ms McMurray

Lothian R&D Project No: 2013/0021

**Title of Research:** Selective attention to anxiety symptoms cues in children with asthma and the relationship with adherence

**REC No:** 13/NS/0013

**Information Sheet (Child):** Version 2 dated 12 February 2013

**Information Sheet (Parent of Asthma patient, Parent of Control):** Version 3 dated 29 April 2013

**Consent Form (Child):** Version 1 dated 12 December 2012

**Assent Form:** Version 1 dated 12 December 2012

**Consent Form (Parent of Asthma patient, Parent of Control, Parent):** Version 2 dated 29 April 2013

**Protocol:** Version 4 dated 29 April 2013

I am pleased to inform you that this study has been approved for NHS Lothian and you may proceed with your research subject to the conditions below. This letter provides Site Specific approval for NHS Lothian

We note that this project includes a researcher(s) who will require an Honorary Research Contract from NHS Lothian. The individual(s) concerned <Helen Lowther> should contact our offices with a view to applying for the necessary documentation. Please note all final paperwork will have to be signed and returned to our R&D offices before the researcher(s) can commence work on the project.

Please note that the NHS Lothian R&D Office must be informed if there are any changes to the study such as amendments to the protocol, recruitment, funding, personnel or resource input required of NHS Lothian. This includes any changes made subsequent to management approval and prior to favourable opinion from the RLC.

Substantial amendments to the protocol will require approval from the ethics committee which approved your study and the MIRA where applicable.

Please inform this office when recruitment has closed and when the study has been completed.

I wish you every success with your study.


Yours sincerely

Dr Douglas Young  
Principal R&D Manager

CC: Paul Doane, CA Manager  
Helen Lowther  
Hemela Shand, NRS  
Edward Doyle, RHSC

## Appendix 7.

### NHS Fife Favourable opinion letter

<b>Operational Division</b> Victoria Hospital	Hayfield Road Kirkcaldy Fife KY2 5AH Telephone 01592 643355 <a href="http://www.show.scot.nhs.uk/ahf">www.show.scot.nhs.uk/ahf</a>	
--	--	---

Mrs Helen Lowther  
NHS Borders  
Andrew Lang Unit  
Viewfield Lane  
SELKIRK  
TD7 4LJ

Date: 28 January 2014

Dear Mrs Lowther

**Letter of access for research**  
**Project Title – “Selective attention in children with asthma” – R&D Ref 13-080**

As an existing NHS employee you do not require an additional honorary research contract with this NHS organisation. We are satisfied that the research activities that you will undertake in this NHS organisation are commensurate with the activities you undertake for your employer. Your employer is fully responsible for ensuring such checks as are necessary have been carried out. Your employer has confirmed in writing to this NHS organisation that the necessary pre-engagement check are in place in accordance with the role you plan to carry out in this organisation. This letter confirms your right of access to conduct research through NHS Fife for the purpose and on the terms and conditions set out below. This right of access commences on 28 January 2014 and ends on 2 October 2014 unless terminated earlier in accordance with the clauses below.

You have a right of access to conduct such research as confirmed in writing in the letter of permission for research from this NHS organisation. Please note that you cannot start the research until the Principal Investigator for the research project has received a letter from us giving permission to conduct the project.

You are considered to be a legal visitor to NHS Fife premises. You are not entitled to any form of payment or access to other benefits provided by this organisation to employees and this letter does not give rise to any other relationship between you and this NHS organisation, in particular that of an employee.

While undertaking research through NHS Fife, you will remain accountable to your employer NHS Borders, but you are required to follow the reasonable instructions of your nominated point of contact Anne McKean, Paediatric Asthma Nurse Specialist in this NHS organisation or those given on her/his behalf in relation to the terms of this right of access. Where any third party claim is made, whether or not legal proceedings are issued, arising out of or in connection with your right of access, you are required to co-operate fully with any investigation by this NHS organisation in connection with any such claim and to give all such assistance as may reasonably be required regarding the conduct of any legal proceedings.

You must act in accordance with NHS Fife policies and procedures, which are available to you upon request, and the Research Governance Framework.

You are required to co-operate with NHS Fife in discharging its duties under the Health and Safety at Work etc Act 1974 and other health and safety legislation and to take reasonable care

Chief Executive Mr John Wilkin  
Victoria Hospital is part of The Operational Division  
of NHS Fife

Vsn 1 – 01.11.08

for the health and safety of yourself and others while on NHS Fife premises. Although you are not a contract holder, you must observe the same standards of care and propriety in dealing with patients, staff, visitors, equipment and premises as is expected of a contract holder and you must act appropriately, responsibly and professionally at all times.

You are required to ensure that all information regarding patients or staff remains secure and *strictly confidential* at all times. You must ensure that you understand and comply with the requirements of the NHS Confidentiality Code of Practice (<http://www.dh.gov.uk/assetRoot/04/06/92/54/04069254.pdf>) and the Data Protection Act 1998. Furthermore you should be aware that under the Act, unauthorised disclosure of information is an offence and such disclosures may lead to prosecution.

NHS Fife will not indemnify you against any liability incurred as a result of any breach of confidentiality or breach of the Data Protection Act 1998. Any breach of the Data Protection Act 1998 may result in legal action against you and/or your substantive employer.

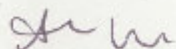
You should ensure that, where you are issued with an identity or security card, a bleep number, email or library account, keys or protective clothing, these are returned upon termination of this arrangement. Please also ensure that while on the premises you wear your ID badge at all times, or are able to prove your identity if challenged. Please note that this NHS organisation accepts no responsibility for damage to or loss of personal property.

We may terminate your right to attend at any time either by giving seven days' written notice to you or immediately without any notice if you are in breach of any of the terms or conditions described in this letter or if you commit any act that we reasonably consider to amount to serious misconduct or to be disruptive and/or prejudicial to the interests and/or business of this NHS organisation or if you are convicted of any criminal offence. Where applicable, your substantive employer will initiate your Independent Safeguarding Authority (ISA) registration in-line with the phasing strategy adopted within the NHS (as from 26<sup>th</sup> July 2010 at the earliest). Once you are ISA-registered, your employer will continue to monitor your ISA registration status via the on-line ISA service. Should you cease to be ISA-registered, this letter of access is immediately terminated. Your substantive employer will immediately withdraw you from undertaking this or any other regulated activity and you MUST stop undertaking any regulated activity.

Your substantive employer is responsible for your conduct during this research project and may in the circumstances described above instigate disciplinary action against you.

If your circumstances change in relation to your health, criminal record, professional registration or ISA registration, or any other aspect that may impact on your suitability to conduct research, or your role in research changes, you must inform the NHS organisation that employs you through its normal procedures. You must also inform your nominated manager in this NHS organisation.

Yours sincerely



Dr Amanda Wood  
R&D MANAGER



Mrs Helen Lowther  
NHS Borders  
Andrew Lang Unit  
Viewfield Lane  
SELKIRK  
TD7 4LJ

Date: 28 January 2014  
Our ref: 13-080 NRS13/PE57  
13/SS/D013  
Enquiries to: Aileen Yell  
Direct Dial: 01383 623623 Ext 20940  
Fax No:  
E-mail: aileen.yell@nhs.net

Dear Mrs Lowther

**Project Title: Selective attention in children with asthma**

Thank you for your application to carry out the above project. Your project documentation (detailed below) has been reviewed for resource and financial implications for NHS Fife and I am happy to inform you that NHS permission for the above research has been granted on the basis described in the application form, protocol and supporting documentation. The documents reviewed were:

Document	Version	Date
REC favourable opinion letter		25 February 2013
IRAS R&D Form	3.4	5 March 2013
REC letter confirming evidence of compliance with approval conditions		11 March 2013
NRS-PCC Certificate of Compliance		11 March 2013
Protocol	4	29 April 2013
REC favourable opinion letter for amendment no 1		8 May 2013
IRAS SSI Form		16 January 2014

The terms of the approval states that you are the Principal Investigator authorised to undertake this study within NHS Fife, with assistance from Anne McKean, Paediatric Asthma Nurse Specialist at Victoria Hospital, Kirkcaldy. Please note that a condition of this approval is that you will have a Letter of Access in place prior to attending in Fife to begin any study procedures.

I note that the favourable ethical opinion applies to all NHS sites taking part in the study therefore no separate Site Specific Review is required in this case.

The sponsors for this study are University of Edinburgh and NHS Lothian.

Details of our participation in studies will be included in annual returns we are expected to complete as part of our agreement with the Chief Scientist Office. Regular reports of the study require to be submitted. Your first report should be submitted to Dr A Wood, R&D Manager, R&D Department, Queen Margaret Hospital, Whitefield Rd, Dunfermline, KY12 0SU (Amanda.wood3@nhs.net) in 12 months time and subsequently at yearly intervals until the work is completed. A Lay Summary will also be required upon completion of the project.

Chief Executive Mr John Wilson  
Victoria Hospital is part of The Operational Division  
of NHS Fife

Ver 1 - 01.11.09

In addition, approval is granted subject to the following conditions:-

All research activity must comply with the standards detailed in the Research Governance Framework for Health & Community Care (<http://www.cso.scot.nhs.uk/publications/resgov/resgov.htm>), health & safety regulations, data protection principles, other appropriate statutory legislation and in accordance with Good Clinical Practice (GCP).

Any amendments which may subsequently be made to the study should also be notified to Aileen Yell, Research Governance Officer ([aileen.yell@nhs.net](mailto:aileen.yell@nhs.net)), as well as the appropriate regulatory authorities. Notification should also be given of any new research team members post approval and/or any changes to the status of the project.

This organisation is required to monitor research to ensure compliance with the Research Governance Framework and other legal and regulatory requirements. This is achieved by random audit of research. You will be required to assist with and provide information in regard to monitoring and study outcomes (including providing recruitment figures to the R&D office as and when required).

As custodian of the information collated during this research project you are responsible for ensuring the security of all personal information collected in line with NHS Scotland IT Security Policies, until the destruction of this data.

Permission is only granted for the activities for which a favourable opinion has been given by the REC (and which have been authorised by the MHRA where appropriate).

The research sponsor or the Chief Investigator or local Principal Investigator at a research site may take appropriate urgent safety measures in order to protect research participants against any immediate hazard to their health or safety. The R&D office ([aileen.yell@nhs.net](mailto:aileen.yell@nhs.net)) should be notified that such measures have been taken. The notification should also include the reasons why the measures were taken and the plan for further action. The R&D office should be notified within the same time frame of notifying the REC and any other regulatory bodies.

I would like to wish you every success with your study and look forward to receiving a summary of the findings for dissemination once the project is complete.

Yours sincerely



**Dr Gordon G Birnie MD FRCP**  
Medical Director, Operational Division

*Co : Aileen Yell, Research Governance Officer, NHS Fife, Queen Margaret Hospital, Dunfermline  
NRSPPC, R&D Office, Foresterhill House Annex, Foresterhill, Aberdeen AB25 2ZR*

## Appendix 8.

### REC major amendment favourable opinion letter

#### Lothian NHS Board

#### South East Scotland Research Ethics Committee 01



Waverley Gate  
2-4 Waterloo Place  
Edinburgh  
EH1 3EG  
Telephone 0131 538 9000  
Fax 0131 465 5789

[www.nhslothian.scot.nhs.uk](http://www.nhslothian.scot.nhs.uk)

Mrs Helen Lowther  
NHS Borders  
Andrew Lang Unit,  
Selkirk  
Scottish Borders  
TD7 4LJ

Date 08 May 2013  
Your Ref  
Our Ref

Enquiries to: Sandra Wyllie  
Extension: 35473  
Direct Line: 0131 465 5473  
Email: [Sandra.Wyllie@nhslothian.scot.nhs.uk](mailto:Sandra.Wyllie@nhslothian.scot.nhs.uk)

Dear Mrs Lowther

**Study title:** Selective attention to anxiety symptom cues in children with asthma and the relationship with adherence  
**REC reference:** 13/SS/0013  
**Protocol number:** n/a  
**Amendment number:** 01  
**Amendment date:** 02 May 2013  
**IRAS project ID:** 114660

The above amendment was reviewed by the Sub-Committee in correspondence.

#### Ethical opinion

The members of the Committee taking part in the review gave a favourable ethical opinion of the amendment on the basis described in the notice of amendment form and supporting documentation.

#### Approved documents

The documents reviewed and approved at the meeting were:

Document	Version	Date
Additional Cover Letter	ex_01	29 April 2013
Participant Consent Form: For parents consenting for child without asthma	par_cont_02	29 April 2013
Participant Consent Form: For parent for their own participation	par_02	29 April 2013
Participant Consent Form: For parent of child with asthma	par_ex_02	29 April 2013
Participant Information Sheet: For parent of children without asthma	par_con_03	29 April 2013
Participant Information Sheet: For parent of children with asthma	par_ex_03	29 April 2013
Protocol	prot_04	29 April 2013
Notice of Substantial Amendment (non-CTIMPs)		02 May 2013



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Waverley Gate, 2-4 Waterloo Place, Edinburgh EH1 3EG

Chair Mr Brian Houston  
Chief Executive Tim Davison  
*Lothian NHS Board is the common name of Lothian Health Board*



**Membership of the Committee**

The members of the Committee who took part in the review are listed on the attached sheet.

**R&D approval**

All investigators and research collaborators in the NHS should notify the R&D office for the relevant NHS care organisation of this amendment and check whether it affects R&D approval of the research.

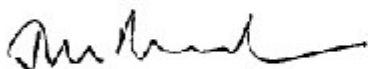
**Statement of compliance**

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

We are pleased to welcome researchers and R & D staff at our NRES committee members' training days – see details at <http://www.hra.nhs.uk/hra-training/>

<b>13/SS/0013:</b>	<b>Please quote this number on all correspondence</b>
--------------------	---

Yours sincerely



**Dr Janet Andrews**  
Chair

E-mail: [Sandra.Wyllie@nhslothian.scot.nhs.uk](mailto:Sandra.Wyllie@nhslothian.scot.nhs.uk)

**Enclosures:** *List of names and professions of members who took part in the review*

**Copy to:** *Ms Karen Maitland, NHS Lothian Research & Development Office*  
*Ms Marianne Laird*

**South East Scotland Research Ethics Committee 01**

**Attendance at Sub-Committee of the REC**

<i>Name</i>	<i>Profession</i>	<i>Capacity</i>
Dr Janet Andrews	Retired	Expert
Mr Lindsay Murray	Health & Safety Manager	Lay Plus

**Also in attendance:**

<i>Name</i>	<i>Position (or reason for attending)</i>
Mrs Sandra Wyllie	Committee Co-ordinator



## Appendix 9.

### Participant information sheet, children without asthma

#### 'The link between childhood asthma and anxiety'



Hi! My name is Helen and I work at the University of Edinburgh. A University is somewhere you go to learn after school. Just like you at school, I have work to do. Part of this work is something called 'research'. Research is a way we try to find out the answers to questions. In my research, I want to ask people with and without asthma some questions. This will help me see how people with asthma feel and think about having asthma.



#### Why do I want to know more about you?

We are including a mix of children who do and do not have asthma in this study. You have been asked to join in as you are the right age for the research. Also you do not have asthma. This means that you can help us answer our questions and are an important part to the research. I have checked with your Head Teacher and I have been allowed to ask you.

#### Did anyone else check the study is OK to do?

Yes they did. It has to be checked by a group of experts and my teachers at University. They check to make sure I am doing it properly.



#### Do I have to take part?

No. It is up to you whether you want to take part or not. If you do not want to join in that is no problem at all.

#### What will happen if I join in?

You will first be asked to sign a form saying you are happy to join in. You will then be asked to sit at a computer for about 10 minutes. There will be words on the screen and



you will be asked to press a key on the keyboard every time you see a dot on the screen. That is all you will need to do.

### **Will joining in help me?**

We cannot promise that the study will help you directly. The results might help children with asthma in the future.

### **What if something goes wrong during the project?**

If something goes wrong and you do not want to carry on with the project, that is fine. You can stop anytime you like. If you want to complain about any part of joining in can do. To see how to do this, look at the bottom of this page or ask your mum or dad.

### **Will my details be kept private if I take part? Will anyone else know I'm doing this?**

All of your details will be kept private in a locked cupboard. No one apart from your mum or dad and teacher will know you are taking part.



### **What if I don't want to do the research anymore?**

If at any time you don't want to join in anymore, just tell me or your parents. No one will be cross with you as it is your choice.

### **Contact details**

These details are for NHS Lothian patients who want to make a complaint:

NHS Lothian Complaints Team  
2nd Floor  
Waverley Gate  
2-4 Waterloo Place  
Edinburgh  
EH1 3EG  
Tel: 0131 465 5708

These details are for NHS Borders patients who want to make a complaint:

Complaints Officer  
NHS Borders  
Borders General Hospital  
Melrose  
TD6 9BS  
Tel: 01896 825 525

## Appendix 10.

### Participant information sheet, parents of children without asthma



#### Information about the research

##### Title of the research

Selective attention to anxiety cues in children with asthma

##### Invitation paragraph

We would like to invite you and your child to take part in our research study. Before you decide we would like you to understand why the research is being done and what it would involve for you. Talk to others about the study if you wish. Ask us if there is anything that is not clear.

This study is interested in the link between asthma and anxiety in children. It is particularly looking at children's attention to words related to anxiety and whether this is linked to taking their inhaler.

##### What is the purpose of the study?

The purpose of this study is to further the research already carried out in the field of childhood asthma and anxiety. This study is looking at the link between asthma and anxiety in more detail. It will tell us if there is a link between attention to anxiety and inhaler use. Furthermore, it will also provide information on how these may be linked with other factors such as quality of life in children with asthma. This will build on existing research and knowledge and may help develop treatment options for children with asthma and anxiety.

##### Why have I and my child been invited?

Your child has been invited to take part as they are aged between 9 and 12. Only children without asthma will be asked to take part in this stage. It is necessary to involve children who do not have asthma as the research requires a comparison group. This research is taking place across NHS Borders and NHS Lothian, and children from your child's school are being asked to participate. We are also interested in your input in this research as the child's caregiver.

##### Do we have to take part?

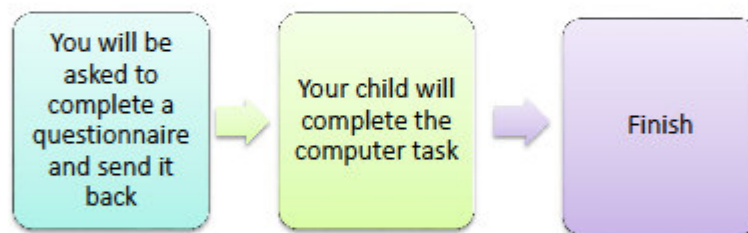
It is up to you to decide to join the study. We will describe the study and can go through this information sheet. If you do not agree to take part you do not need to do anything. You and your child are free to withdraw at any time, without giving a reason. This would not affect anything related to your child's care or schooling.



### **What will happen to me and my child if we take part?**

If you agree to you and your child being involved in the research the process is outlined below.

- You will be posted or given this information sheet from your child's school. There will also be a consent sheet which you will be asked to sign and send/give back to the school if you and your child would like to take part in the research.
- If you would like to take part in this research your child will be asked to complete a task at a computer for approximately 10 minutes. This task involves your child looking at the screen and pressing a button when they see a dot appear on the screen. This will take place whilst they are at school. This will measure your child's attention to anxiety related words.
- You, as the caregiver will also be asked to fill out a questionnaire measuring general anxiety levels will take approximately 5 minutes. This will be posted out to you if you initially acknowledge interest in taking part along with a demographics sheet. You can send these back into school in a sealed envelope.
- This will be the end of your involvement in the research.



### **What will I be asked to do?**

You will be asked to fill out a questionnaire measuring general anxiety levels which will take approximately 5 minutes.

### **What are the possible disadvantages of taking part?**

Taking part in the research will take a short amount of time out of your schedule.

### **What are the possible benefits of taking part?**

We cannot promise that the study will help you directly, but the information we get from this study may help improve the treatment for children with asthma and anxiety.

### **What will happen if I don't want to carry on with the study?**

If you do not want to carry on with the study you may withdraw at anytime. You and your child will be given a unique participant number, and so it will be possible to locate and destroy any information you may have submitted prior to withdrawing. Therefore withdrawing from the study will also withdraw any information linked to you.

### **What if there is a problem?**

If you have a concern about any aspect of this study, you should ask to speak to the researchers who will do their best to answer your questions either in person or on 01750 23715. If you remain unhappy and wish to complain formally, you can do this by following the NHS Complaints procedure. Please see the end of this document for contact details.

It is unlikely that you will be harmed during this research, however in the event that something does go wrong and you are harmed and this is due to someone's negligence then you may have grounds for a legal action for compensation against NHS Borders or NHS Lothian, but you may have to pay your legal costs. The normal National Health Service complaints mechanisms will still be available to you (if appropriate).

### **Will my taking part in the study be kept confidential?**

Yes, during and after the study has taken place, all of your details will be kept confidential. All information which is collected about you during the course of the research will be kept strictly confidential, and any information about you which leaves the school will have your details removed so that you cannot be recognised. Your information will not be used in future studies, and will be destroyed after a period of time.

### **What will happen to the results of the research study?**

The results of the research study will be written up as a research Thesis and possibly published in a peer reviewed journal. Results will be made available to the participants by publishing findings on a website. The details of this will be provided to participants through the school, so they are able to view the website. No participant will be identified in any report or publication.

### **Who has reviewed this study?**

All research in the NHS is looked at by independent group of people, called a Research Ethics Committee, to protect your interests. This study has been reviewed and given favourable opinion by the South East Scotland Research Ethics Service.

#### **Further information and contact details**

If you have any further questions about the study please contact Helen Lowther on 01750 23715 or email: [Helen.lowther@borders.scot.nhs.uk](mailto:Helen.lowther@borders.scot.nhs.uk).

If you would like to discuss this study with someone independent of the study team please contact: Nuno Ferreira on 0131 650 3898 or email: [Nuno.Ferreira@ed.ac.uk](mailto:Nuno.Ferreira@ed.ac.uk).

If you are an NHS Lothian patient and wish to make a complaint about the study please contact NHS Lothian:

NHS Lothian Complaints Team  
2nd Floor  
Waverley Gate  
2-4 Waterloo Place  
Edinburgh  
EH1 3EG  
Tel: 0131 465 5708

Similarly, if you are an NHS Borders patient and wish to make a complaint about the study, please contact NHS Borders:

Complaints Officer  
NHS Borders  
Borders General Hospital  
Melrose  
TD6 9BS  
Tel: 01896 825 525



## Appendix 11.

### Participant information sheet, children with asthma



## 'The link between childhood asthma and anxiety'

Hi! My name is Helen and I work at the University of Edinburgh. A University is somewhere you go to learn after school. Just like you at school, I have work to do. Part of this work is something called 'research'. Research is a way we try to find out the answers to questions. In my research, I want to ask people with asthma some questions. This will help me see how people with asthma feel and think about having asthma.



### Why do I want to know more about you?

I am asking people who are your age and who have asthma. This means you are an important part of my work.

### Did anyone else check the study is OK to do?

Yes they did. It has to be checked by a group of experts and my teachers at University. They check to make sure I am doing it properly.



### Do I have to take part?

No. It is up to you whether you want to take part or not. If you do not want to join in that is no problem at all.

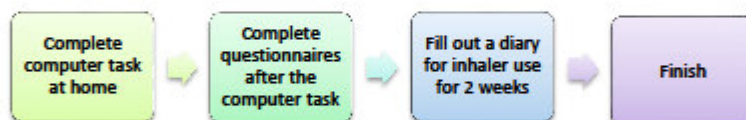
### What will happen if I join in?

You will first be asked to sign a form saying you are happy to join in. I will visit you at home and answer any questions you might have. You will be asked to sit at a computer for about 15 minutes. There will be words on the screen and you will be asked to press a key on the keyboard every time you see a dot on the screen.

After this, you will then be asked to fill in some questionnaires



which will be done with help from me. The questionnaires will last about 25 minutes. If you get tired you can have a break at any time. I will then give you a diary and ask you and your mum and dad to fill this out about your inhaler use. You will be asked to fill this out for 2 weeks. The picture below shows what you will be asked to do.



### **Will joining help me?**

We cannot promise that the study will help you directly. The results might help children with asthma in the future.

### **What if something goes wrong during the project?**

If something goes wrong and you do not want to carry on with the project, that is fine. You can stop anytime you like. If you want to complain about any part of joining in you can do. To see how to do this, look on the next page or ask your mum or dad.

### **Will my details be kept private if I take part? Will anyone else know I'm doing this?**

All of your details will be kept private in a locked cupboard. The only people who will know you are joining in are your mum and dad. Also the Doctor or nurse who talks to you about it will know.



### **What if I don't want to do the research anymore?**

If at any time you don't want to join in anymore, just tell me or your parents. No one will be cross with you as it is your choice.



### Contact details

These details are for NHS Lothian patients who want to make a complaint:

NHS Lothian Complaints Team  
2nd Floor  
Waverley Gate  
2-4 Waterloo Place  
Edinburgh  
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Tel: 0131 465 5708

These details are for NHS Borders patients who want to make a complaint:

Complaints Officer  
NHS Borders  
Borders General Hospital  
Melrose  
TD6 9BS  
Tel: 01896 825 525

These details are for NHS Fife Patients who want to make a complaint:

Patient Relation Department  
Fife NHS Board  
Room 104  
Hayfield House  
Hayfield Road  
Kirkcaldy  
KY2 5AH  
Tel: 01592 648153 Ext: 28153

## Appendix 12.

### Participant information sheet, parents of children with asthma



#### Information about the research

##### Title of the research

Selective attention to anxiety cues in children with asthma

##### Invitation paragraph

We would like to invite you and your child to take part in our research study. Before you decide we would like you to understand why the research is being done and what it would involve for you. One of the team will go through the information sheet with you and answer any questions you have at your next contact with them. We would suggest this should take about 5 minutes. Talk to others about the study if you wish. Ask us if there is anything that is not clear.

This study is interested in the link between asthma and anxiety in children. It is particularly looking at children's attention to anxiety to words related to anxiety and whether this is linked to taking their inhaler.

##### What is the purpose of the study?

The purpose of this study is to further the research already carried out in the field of childhood asthma and anxiety. This study is looking at the link between asthma and anxiety in more detail. It will tell us if there is a link between attention to anxiety and inhaler use. Furthermore, it will also provide information on how these may be linked with other factors such as quality of life in children with asthma. This will build on existing research and knowledge and may help develop treatment options for children with asthma and anxiety.

##### Why have I and my child been invited?

Your child has been invited to take part as they are aged between 9 and 12 and have asthma. This research is taking place across NHS Borders, NHS Lothian and NHS Fife and every child and their caregiver attending an asthma clinic in one of these areas will be approached to take part in this research. We are also interested in your input in this research as the child's caregiver.

##### Do we have to take part?

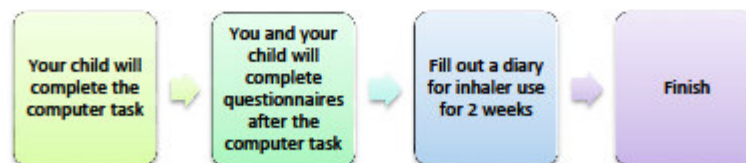
It is up to you to decide to join the study. The team will describe the study at your next contact with them and go through this information sheet. If you agree to take part, you and your child will be then asked to sign a consent form. You and your

child are free to withdraw at any time, without giving a reason. This would not affect the standard of care your child receives.

### **What will happen to me and my child if we take part?**

The process is outlined below.

- You will have first received a letter of invitation and this information sheet detailing the study.
- If you are interested in taking part you can talk to the asthma team at your next contact with them, or ring in to make an appointment. If you decide to take part, you will be asked to provide your telephone number so the researcher can ring you to book a time for your child to participate in the study. You will be asked to sign a consent form at your usual asthma clinic appointment. In addition, your child may be asked to sign their own consent form if it is thought they are able to do this.
- The researcher will speak to you on the phone to ask if it is ok to come to your house at a time convenient for you, for your participation.
- Your child will be asked to complete a task for approximately 15 minutes at a laptop that the researcher will bring. This task involves your child looking at the screen and pressing a button when they see a dot appear on the screen. This will measure your child's attention to words related to anxiety.
- After the computer task your child will be asked to complete questionnaires with the researcher's help. This part will last approximately 25 minutes. These questionnaires are to look at how your child feels about their asthma, and how they cope with it.
- You, as the caregiver will also be asked to fill out a questionnaire on general anxiety levels at the same time which will take approximately 5 minutes.
- You will then be asked to use a diary provided for you to record the number of times your child uses his/her reliever inhaler over the following 2 weeks. This can then be posted in a stamped envelope you will be given, or you can drop it back into the hospital.
- This will be the end of your involvement in the research.





**What will I be asked to do?**

You will be asked to fill out a questionnaire measuring general anxiety levels which will take approximately 5 minutes. You will then be asked to help with filling out an inhaler use diary for the 2 weeks following.

**What are the possible disadvantages of taking part?**

Taking part in the research will take a short amount of time out of your schedule.

**What are the possible benefits of taking part?**

We cannot promise that the study will help you directly, but the information we get from this study may help improve the treatment for children with asthma and anxiety.

**What will happen if I don't want to carry on with the study?**

If you don't want to carry on with the study you may withdraw at anytime. You and your child will be given a unique participant number, and so it will be possible to locate and destroy any information you may have submitted prior to withdrawing. Therefore withdrawing from the study will also withdraw any information linked to you.

**What if there is a problem?**

If you have a concern about any aspect of this study, you should speak to the researchers who will do their best to answer your questions either in person or on 01750 23715. If you remain unhappy and wish to complain formally, you can do this by following the NHS Complaints procedure. Please see the end of this document for contact details

It is unlikely that you will be harmed during this research, however in the event that something does go wrong and you are harmed and this is due to someone's negligence then you may have grounds for a legal action for compensation against NHS Borders, NHS Lothian or NHS Fife but you may have to pay your legal costs. The normal National Health Service complaints mechanisms will still be available to you (if appropriate).

**Will my taking part in the study be kept confidential?**

Yes, after the study has taken place all of your details will be kept confidential. All information which is collected about you during the course of the research will be kept strictly confidential, and any information about you which leaves the hospital will be kept in a locked, secure filing cabinet. Your information will not be used in future studies, and will be destroyed after a period of time.

### **What will happen to the results of the research study?**

The results of the research study will be written up as a research Thesis and possibly published in a peer reviewed journal. Results will be made available to the participants by publishing findings on a website. The details of this will be provided to participants through their routine asthma clinics, so they are able to view the website. No participant will be identified in any report or publication.

### **Who has reviewed this study?**

All research in the NHS is looked at by independent group of people, called a Research Ethics Committee, to protect your interests. This study has been reviewed and given favourable opinion by the South East Scotland Research Ethics Service.

### **Further information and contact details**

If you have any further questions about the study please contact Helen Lowther on 01750 23715 or email: [Helen.lowther@borders.scot.nhs.uk](mailto:Helen.lowther@borders.scot.nhs.uk).

If you would like to discuss this study with someone independent of the study team please contact Nuno Ferreira on 0131 650 3898 or email: [Nuno.Ferreira@ed.ac.uk](mailto:Nuno.Ferreira@ed.ac.uk).

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Melrose  
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Tel: 01896 825 525

These details are for NHS Fife Patients who want to make a complaint:

Patient Relation Department  
Fife NHS Board  
Room 104  
Hayfield House  
Hayfield Road  
Kirkcaldy  
KY2 5AH  
Tel: 01592 648153 Ext: 28153

### Appendix 13.

#### Cover letter to potential participants



Address of relevant Hospital  
to be inserted here

Enquiries to: Ann McMurray/Andrew Duncan, tel no: (inset number)

Dear (patient/caregiver name),

**RE: Research study – Selective attention to anxiety cues in children with asthma.**

We are writing to tell you about some research that is happening which is linked to the asthma clinic you go to. The research is being carried out by a University student called Helen Lowther. We have included some detailed information about this research with this letter. One sheet is made for the parent to read and one sheet is made for the child to read. We wanted to give you a chance to read the information before your next asthma clinic appointment. If you would like to take part in the research you can talk to us about it at your next appointment.

Your name and address has not been given to anyone, this will only happen if you decide you want to take part in the study. If you want to know more before your next appointment you can phone your usual asthma nurse and ask for details.

Thank you for taking time to read this letter.

Yours sincerely,

Respiratory Team

Royal Hospital for Sick Children/Borders General Hospital

## Appendix 14.

### Permission to use the State-Trait Anxiety Inventory

For use by helen lowther only. Received from Mind Garden, Inc. on December 12, 2012



[www.mindgarden.com](http://www.mindgarden.com)

To whom it may concern,

This letter is to grant permission for the above named person to use the following copyright material;

Instrument: *State-Trait Anxiety Inventory for Adults*

Authors: *Charles D. Spielberger, in collaboration with R.L. Gorsuch, G.A. Jacobs, R. Lushene, and P.R. Vagg*

Copyright: *1968, 1977 by Charles D. Spielberger*

for his/her thesis research.

Five sample items from this instrument may be reproduced for inclusion in a proposal, thesis, or dissertation.

The entire instrument may not be included or reproduced at any time in any other published material.

Sincerely,

Robert Most  
Mind Garden, Inc.  
[www.mindgarden.com](http://www.mindgarden.com)

## Appendix 15.

### Dot probe threat word stimuli

Asthma - Neutral	Anxiety symptom - Neutral	General negative - Neutral
Dust - lake	Afraid - window	Sad - pot
Smoke - glass	Anxious - bathing	Unhappy - vehicle
Air - bag	Crazy - broom	Bad - top
Puff - coal	Dizzy - whisk	Angry - books
Cough - glove	Fear - bell	Frighten - driveway
Asthma - carrot	Fright - sponge	Upset - clock
Puffer - wigwam	Mad - tap	Fight - phone
Wheeze - stilts	Mental - plants	Hurt - town
Lungs - stone	Nervous - bedroom	Horrible - computer
Breathe - teacher	Panic - tiles	Pain - seat
Choke - shelf	Scared - shower	Bleeding - mountain
Chest - queen	Shaking - washing	Punished - daylight
Throat - church	Shiver - frying	Test - wall
Airway - crayon	Sick - bowl	Accident - bathroom
Gasp - twig	Sweat - spoon	Stranger - shopping
Raspy - inbox	Tremble - roofing	Lost - home



## **Appendix 16.**

### **Pilot word testing results**

#### **Dot Probe Stimuli**

##### *Method*

##### *Participants*

In order to pilot the dot probe word stimuli, 10 children aged nine years were selected from a school in Scotland. Children were selected on the basis of their age, as the youngest participants in the research project were nine years old. Five girls and five boys with a range of reading and comprehension abilities were selected by their class teacher. Therefore, the 10 children were made up of children classed as low average, average and high average. The researcher was unaware which children fell into which category.

15 Trainee Clinical Psychologists were subsequently asked to rate the potential words which had been piloted and included for further testing.

##### *Word stimuli*

The words which were piloted with the children were all of the words which had not previously been proven to be readable by the age range used in the research. This comprised 24 asthma related words and 76 neutral words.

##### *Procedure*

Children were presented with a list of the 100 words printed with black ink over three sheets of white, A4 paper. The font was 14 point comic sans. This took place in a quiet room in the school with the child and the researcher present. Each child was asked to read through the list of words and if a child was either unable to read a word or stumbled upon it >three times, a mark was placed by the word by the researcher, out of the eye line of the child. This procedure was repeated with all children.

To further test the words, each Trainee Clinical Psychologist was asked to rate each word on a scale of 1 (not at all) to 5 (very much) for 1) relatedness to anxiety symptoms and 2) relatedness to asthma. They were also asked to rate the words on emotional valence from -3 (very negative) to +3 (very positive).

#### **Results**

From the 24 asthma words which were piloted, two were excluded from further analysis due to the pilot sample having difficulty in reading them (phlegm and mucus). No neutral words were excluded.

In total, the word raters were given 266 words to rate made up of the piloted words and also words from previous research which had been shown to be readable by the age group.

### ***Asthma and anxiety words***

In order to be sure that the asthma and anxiety symptom words were significantly different, a two stage approach was adopted. First, the rating scales were screened and asthma and physical anxiety words were only included if they rated over three on their congruent relatedness scale, and under three on the incongruent relatedness scale.

Out of the 22 which were put forward for rating, 16 asthma words were deemed to be different enough from the anxiety words. Of the 37 anxiety related words, 18 words were deemed to be related to anxiety and significantly different to the asthma words. An additional two words were excluded from the anxiety group to ensure both groups were comprised of 16 words.

The included words after this stage were further checked by performing paired t tests. Here, the anxiety words were shown to be significantly different to asthma words in terms of their mean relatedness to anxiety  $t(15), 20.8, p<0.01$ . Similarly, the asthma words were shown to be significantly different to the anxiety words in terms of their mean relatedness to asthma  $t(15), -14.8, p<0.01$ .

### ***Neutral words***

It was also important to only include neutral words which were deemed to have no emotional content. Therefore, neutral words were only included if they were rated as zero on the emotional valence scale and one on the asthma or anxiety symptom relatedness scales.

### ***Emotionality***

It was also necessary to make sure that the physical anxiety and the general emotional words were similar in terms of their emotional content. It was shown that there was no significant difference between physical anxiety and negative emotion word groups in terms of emotionality ratings  $t(15), 0.40, p=0.69$ .

### ***Word length***

Lastly, it was shown that there was no significant difference in terms of word length between each of the three word categories (asthma, anxiety symptom, general negative emotion)  $F(2,45) = 0.54, p = 0.59$ .

### ***Conclusions***

In piloting and testing the words to be included in the research, a number of factors can be concluded. First, a certain amount of confidence can be had that all of the words to be used in the research can be read by nine to twelve year olds without significant reading problems. In addition, it can be assumed that the asthma and physical anxiety words are significantly different from one another. The physical anxiety and general negative emotion words are similar in terms of their emotion ratings and all groups of words are similar in terms of the length of words that comprise each group. Finally, all neutral words were deemed to have no emotional content by the raters.